FINAL
Environmental Impact Statement

Update of the Water Control Manual for the Apalachicola-Chattahoochee-Flint River Basin in Alabama, Florida, and Georgia and a Water Supply Storage Assessment

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Appendix B

Water Supply Storage Assessment Report

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US Army Corps of Engineers ®

Apalachicola Chattahoochee Flint Water Supply Storage Assessment

An Evaluation of Water Supply Storage from Lake Lanier

U.S. Army Corps of Engineers

November 2016

APALACHICOLA-CHATTAHOOCHEE-FLINT (ACF) WATER SUPPLY STORAGE ASSESSMENT

An Evaluation of Water Supply Storage from Lake Lanier

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An Evaluation of Water Supply Storage from Lake Lanier

EXECUTIVE SUMMARY

This water supply storage assessment was prepared in response to requests for water supply storage in Lake Lanier by the State of Georgia on May 16, 2000. By letter dated January 11, 2013, the State of Georgia provided updated information and data relevant to the 2000 request. Following a 2011 court decision, the U.S. Army Corps of Engineers (USACE) reconsidered the applicable legal authorities and concluded that it has the legal authority to accommodate Georgia's request, subject to further analysis and evaluation of environmental impacts. During the public comment period of the Draft Apalachicola-Chattahoochee-Flint (ACF) Water Control Manual (WCM) Environmental Impact Statement (EIS) and the Water Supply Storage Assessment (WSSA), the State of Georgia submitted a revised water supply storage request on December 4, 2015. The ACF WCM Environmental Impact Statement and the Water Supply Storage Assessment in this appendix provide the additional information necessary for the USACE to determine whether and to what extent to accommodate Georgia's revised water supply request.

The Proposed Action Alternative, which meets a gross need of 242 million gallons per day (mgd), including 20 mgd covered under two current relocation contracts for the cities of Buford and Gainesville and a reallocation of 254,170 acre-feet (ac-ft) of storage equivalent to 222 mgd, is evaluated for financial feasibility in this assessment.[1] Various water supply volumes from Lake Lanier underwent full impacts analysis in the EIS. A full range of water supply options were considered in this assessment.

Construction of Lake Lanier began in 1950 and was completed in 1957 (reservoir did not completely fill until 1959) by the USACE for the authorized purposes of flood control (now referred to as flood risk management), water supply, hydroelectric power, navigation, fish and wildlife conservation, and recreation. Two water withdrawal contracts were authorized as part of the original project, 2 mgd for the City of Buford and 8[2] mgd for the City of Gainesville, as compensation to property owners (the Cities

[1]From ER 1105-2-100 Appendix E page E -203. "The conceptual basis for evaluating the benefits from municipal and industrial water supply is society's willingness to pay for the increase in the value of goods and services attributable to the water supply. Where the price of water reflects its marginal cost, that price is used to calculate willingness to pay for additional water supply. In the absence of such direct measures of marginal willingness to pay, the benefits from a water supply plan are measured instead by the resource cost of the alternative most likely to be implemented in the absence of that plan."

[2]Presently, Gainesville withdraws 18 mgd and returns 10 mgd resulting in a net withdrawal of 8 mgd. The total gross withdrawal under relocation contracts is 20 mgd.

of Buford and Gainesville) for the taking of property associated with construction of Buford Dam (Lake Lanier). Both cities had existing intake structures and water treatment plants on riparian lands prior to commencement of project construction. Under relocation agreements, the cities were allowed to relocate their existing water supply intakes and continue to withdraw water from Lake Lanier.

This assessment also addresses the current and future water supply needs for current and future users of Lake Lanier in the State of Georgia. It evaluates various measures to provide the water specified in Georgia's request, including reallocation from the conservation storage. Reallocation from the conservation storage was found to be economically viable and was evaluated through full environmental impacts analysis.

A full impacts analysis was conducted on nine water supply and water management scenarios. The impacts are presented in Chapter 6 of the EIS.

When a portion of conservation storage is allocated to accommodate water supply withdrawals, other authorized purposes, in particular hydropower generation, may be affected. The effects on other authorized purposes for certain water supply alternatives have been analyzed and are set forth in this WSSA and the EIS.

For the reallocation of 254,170 ac-ft of storage, the average annual cost, which is the updated cost of storage, evaluated over a 50-year economic evaluation period and the Fiscal Year (FY) 2017 discount[3] rate of 2.875 percent, would be $2,769,000.

Average annual water supply benefits for the reallocation of 254,170 ac-ft of storage (about 222 mgd), evaluated over a 50-year economic evaluation period and a discount rate of 2.875 percent, would be $54,315,000 (including operations and maintenance (O&M)). This value is based on cost most likely alternative with the least cost that would be implemented in the absence of reallocation from Lake Lanier.

To test the financial feasibility of storage reallocation from Lake Lanier, the annual cost of the proposed reallocated storage was compared to the annual cost of the most likely, least costly, water supply source that would provide an equivalent quality and quantity of water if storage reallocation at Lake Lanier were not an option for the State of Georgia. The proposed Chattahoochee River Withdrawal and Pumping scenario was found to be the most likely and least costly water supply alternative to Lake Lanier storage reallocation. The proposed Chattahoochee River Withdrawal and Pumping scenario would pump water from downstream of Lake Lanier, treat the water for supply, distribute to users, and release it into Lake Lanier. The construction would involve building an infrastructure of piping and pumping stations to tie in with the existing distribution network. The proposed Chattahoochee River Withdrawal and Pumping

[3]Discount rate may change each fiscal year based on Economic Guidance issued by Headquarters USACE. The terms discount rate and interest rate may be used interchangeably.

scenario can supply about 222 mgd for the State of Georgia and would have an estimated average annual cost of about $54,315,000. The reallocation of storage in Lake Lanier, with an average annual cost of $2,769,000 passes the test of financial feasibility by a factor of more than 19 to 1.

USACE regulations require that the cost of storage allocated to the non-Federal sponsor will normally be established as the highest of four pricing methods: benefits or revenues foregone, replacement cost, or updated cost of storage in the Federal project. The pricing method applicable to the water supply storage allocated to the State of Georgia is the “updated cost of storage”. The updated cost of reallocated storage is estimated by updating the cost of the joint use features from the midpoint of construction to the FY in which the reallocation of storage is approved. The updated cost of the joint use features is then multiplied by the proportion of useable storage that is to be reallocated to estimate the value of the reallocated storage.

The value of the 254,170 ac-ft of storage proposed for reallocation is calculated to be $60,534,000 based on updated cost of storage for FY2017. The annual value would be $2,892,000 based on a 30-year repayment period with an interest rate of 2.5 percent. Using a 5-year average for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) expenses for Fiscal Years 2011-2015, the estimated annual O&M cost would be about $471,000. The total annual payment during the 30-year repayment period would be $3,367,000. An annual payment for OMRR&R would continue to be made by the State of Georgia following the 30-year storage repayment period.

1.0 PURPOSE

On May 16, 2000, the Governor of the State of Georgia submitted a formal request to the Assistant Secretary of the Army (Civil Works) (ASA(CW)) to adjust the operation of Lake Lanier, and to enter into agreements with the State, or water supply providers, to accommodate increases in water supply withdrawals from Lake Lanier and downstream at Atlanta over the next 30 years, culminating in total, gross withdrawals of 705 mgd, 297 mgd from Lake Lanier and 408 mgd downstream, by the year 2030. The Assistant Secretary of the Army (Civil Works) in 2002 denied Georgia's request concluding that a reallocation of conservation storage in Lake Lanier sufficient to accommodate the requested withdrawals would exceed the Secretary's authority. The 2011 decision of the 11th Circuit Court of Appeals, discussed in more detail in Section 3.5.2.8.2 of the EIS, set aside the Army's 2002 decision to deny Georgia's request and ordered the USACE to reconsider whether it has the legal authority to operate the Buford Project to accommodate Georgia's request.

The 11th Circuit Court remanded the case to the district court with instructions to remand to the USACE for further proceedings "not inconsistent with this order." On October 5, 2011, the district court remanded the matter to the USACE in accordance with the appeals court's instructions to reconsider whether it has the legal authority to operate the Buford Project to accommodate Georgia's request, in light of the legal authority conferred by Congress in the River and Harbor Act of 1946, Public Law No. 84-841 (July 30, 1956) (1956 Act), and the Water Supply Act of 1958.

In June 2012, the USACE submitted a Legal Opinion to the 11th Circuit Court, incorporated by reference (Memorandum for the Chief of Engineers, Subject: Authority to Provide for Municipal and Industrial Water Supply from the Buford Dam/Lake Lanier Project, Georgia dated 25 June 2012 (http://www.sam.usace.army.mil/Portals/46/docs/planning_environmental/acf/docs/2012ACF_legalopinion.pdf) stating "the Corps has the legal authority to accommodate Georgia's request to withdraw 297 mgd from Lake Lanier, if return flows of 107 mgd are provided, and to make releases from Buford Dam to ensure minimum flows of 1381 cubic feet per second (cfs) downstream at Atlanta, enabling downstream withdrawals of 408 mgd, by the year 2030." The legal opinion further concluded that the USACE has sufficient authority under applicable law to accommodate Georgia's 2000 request, but noted that any decision to take action on Georgia's request would require further study.

On January 11, 2013, the Governor of the State of Georgia provided updated demographic and water demand data to confirm the continued need for 705 mgd to meet Georgia's water needs from Lake Lanier and the Chattahoochee River to approximately the year 2040 rather than 2030 as specified in the 2000 request (hereafter referred to as Georgia's 2013 request). Following publication of the draft WSSA and draft EIS in October 2015, the Georgia Environmental Protection Division

(GAEPD) provided additional updated demographic and water demand data (hereafter referred to as Georgia's 2015 request) that revised its 2013 request as follows:

- To provide for withdrawals directly from Lake Lanier in the amount of 242 mgd by 2050 (in lieu of 297 mgd by 2040 per the 2013 request) and
- To provide for releases from Buford Dam to accommodate withdrawals from the Chattahoochee River above the confluence with Peachtree Creek in the range of 355 mgd to 379 mgd by 2050 (in lieu of 408 mgd by 2040 per the 2013 request).

In commenting on the draft EIS, GAEPD noted that the certification of need for Glades Reservoir has been rescinded and that Glades will not be constructed and operated for water supply during the horizon (2050) for Georgia's 2015 request because it is no longer needed for this purpose[4]. Accordingly, Glades Reservoir will not be considered in this assessment as a potential source of water to satisfy a portion of Georgia's 2050 water supply needs.

Based on Georgia's 2015 request, the draft WSSA has been revised to address the reduced need for withdrawals from Lake Lanier. Georgia's revised request and supplemental information is contained in Appendix A to this assessment.

This WSSA adopts the 2012 Legal Opinion analysis of the USACE's authority to provide water supply at Lake Lanier. This assessment will recommend what amount of storage, if any, that should be reallocated from conservation storage to water supply to meet Georgia's 2015 request. Additionally, if reallocation of storage is recommended, this assessment will identify the cost of the reallocated storage along with economic impacts; environmental impacts are discussed in the EIS and its associated appendices.

1.1 Authority

The national policy of the United States regarding water supply, as defined by Congress, has been developed over a number of years and is still being clarified and extended by legislation. This policy is based on recognition that states and non-Federal entities have the primary responsibility in the development and management of their water supplies[5].

1.1.1 Public Law No. 84-841 "1956 Act"

Public Law 84-841, enacted July 30, 1956 (1956 Act), granted USACE authority to enter into an agreement with Gwinnett County, Georgia, for the allocation of 11,200 ac-ft of storage for regulated water supply. Any water supply storage volumes evaluated in this

[4]GAEPD letter dated January 29, 2016, page 10 of 31 (see ACF238 in Appendix C) and Exhibit H thereto.
[5]ER-1105-2-100 Appendix E pg. E-200.

assessment will be considered for reallocation solely under the Water Supply Act of 1958 described below.

1.1.2 Water Supply Act of 1958

Reallocation is the reassignment of the use of existing storage space in a reservoir project from one purpose to another. Authority for the USACE to reallocate existing storage space to municipal and industrial (M&I) water supply is contained in Public Law 85-500, Title III, Water Supply Act of 1958, as amended , codified at (43 U.S.C. § 390b). Section 390b(b), of this Act states ". . . it is hereby provided that storage may be included in any reservoir project surveyed, planned, constructed or to be surveyed, planned, and/or constructed . . . to impound water for present or anticipated future demand or need for municipal and industrial water supply." Section 390b(e) of the Act states "[M]odifications of a reservoir project theretofore authorized, surveyed, planned, or constructed to include storage as provided in subsection (b), which would seriously affect the purposes for which the project was authorized, surveyed, planned, or constructed, or which would involve major structural or operational changes, will be made only upon the approval of Congress as now provided by law." (USACE, 1998)

2.0 PROJECT BACKGROUND

2.1 Authorization and Construction

Lake Lanier (Buford Dam), Georgia, was authorized by the River and Harbor Act approved July 1946 for the purposes of flood control (now referred to as flood risk management), fish and wildlife conservation, recreation, navigation, water supply, and hydropower. Construction for Lake Lanier began in 1950. The project became operational in 1957 and achieved full pool in May 1959.

2.1.1 Reservoir Description

Lake Lanier has a storage capacity (at the top of conservation pool - elevation 1,071 feet (ft)) of 1,948,900 ac-ft. Of that, 1,074,600 ac-ft is conservation storage and 874,300 ac-ft is inactive storage (Figure 1). The minimum conservation pool elevation is 1,035 ft, and the maximum conservation pool elevations are 1,071 ft in the summer and 1,070 ft in the winter. In addition, 602,200 ac-ft is reserved for flood storage between elevation 1,071 and 1,085. Total usable storage (the volume of water between the outlet works and the spillway crest) includes conservation storage plus flood storage (1,676,800 ac-ft). Lake Lanier has a surface area of 38,542 acres at elevation 1,071 ft.

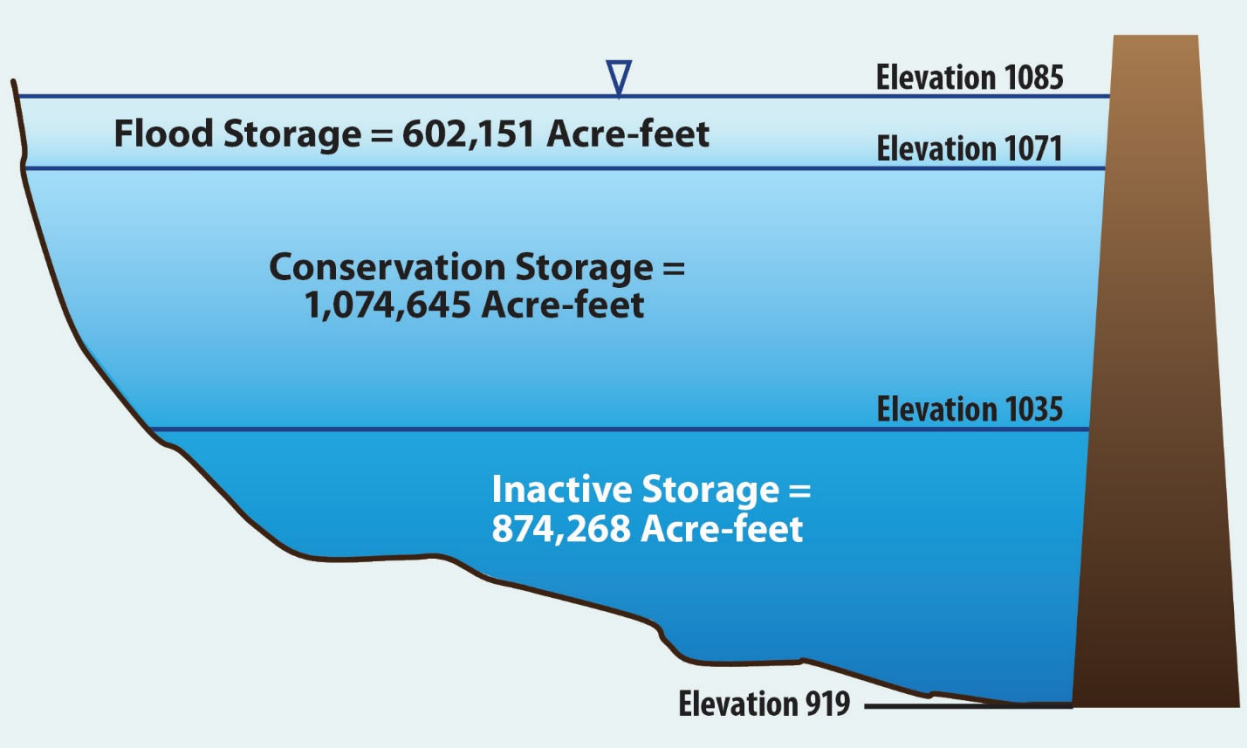

Figure 1. Buford Storage Capacity

2.2 Study Area

The study area is the area within which significant project impacts will accrue from the use of M&I water supplies, including areas that will receive direct benefits and/or incur costs from the provision of M&I water supply per ER 1105-2-100 Appendix E pg. E-205. The water supply needs analysis is limited to the Atlanta/Lake Lanier region which was part of the Georgia's 2015 revised request. The 2013 request was previously evaluated in the draft EIS. The 2015 revised request represented a reduced amount. Any reallocation of storage would be expected to have system wide effects, which the USACE must take into account. Therefore, the study area will encompass the entire ACF Basin.

The Chattahoochee River originates in the Blue Ridge Mountains of north Georgia, near the westernmost tip of South Carolina, and extends to the southwest corner of the state. The Chattahoochee River covers a distance of 434 miles from the Blue Ridge Mountains to Lake Seminole. It flows out of the mountains, past Metro Atlanta, and reaches the Georgia-Alabama border, at which point it forms the border between the two states. From there, the Chattahoochee River flows south to its confluence with the Flint River at Lake Seminole and then into the Apalachicola River.

The largest metropolitan area in the basin is Atlanta, Georgia, located in the northern section. Progressing downstream are the Cities of Columbus, Georgia and Phenix City,

Alabama. Albany, Georgia is located in the eastern portion of the basin. At the Gulf of Mexico is the City of Apalachicola, Florida.

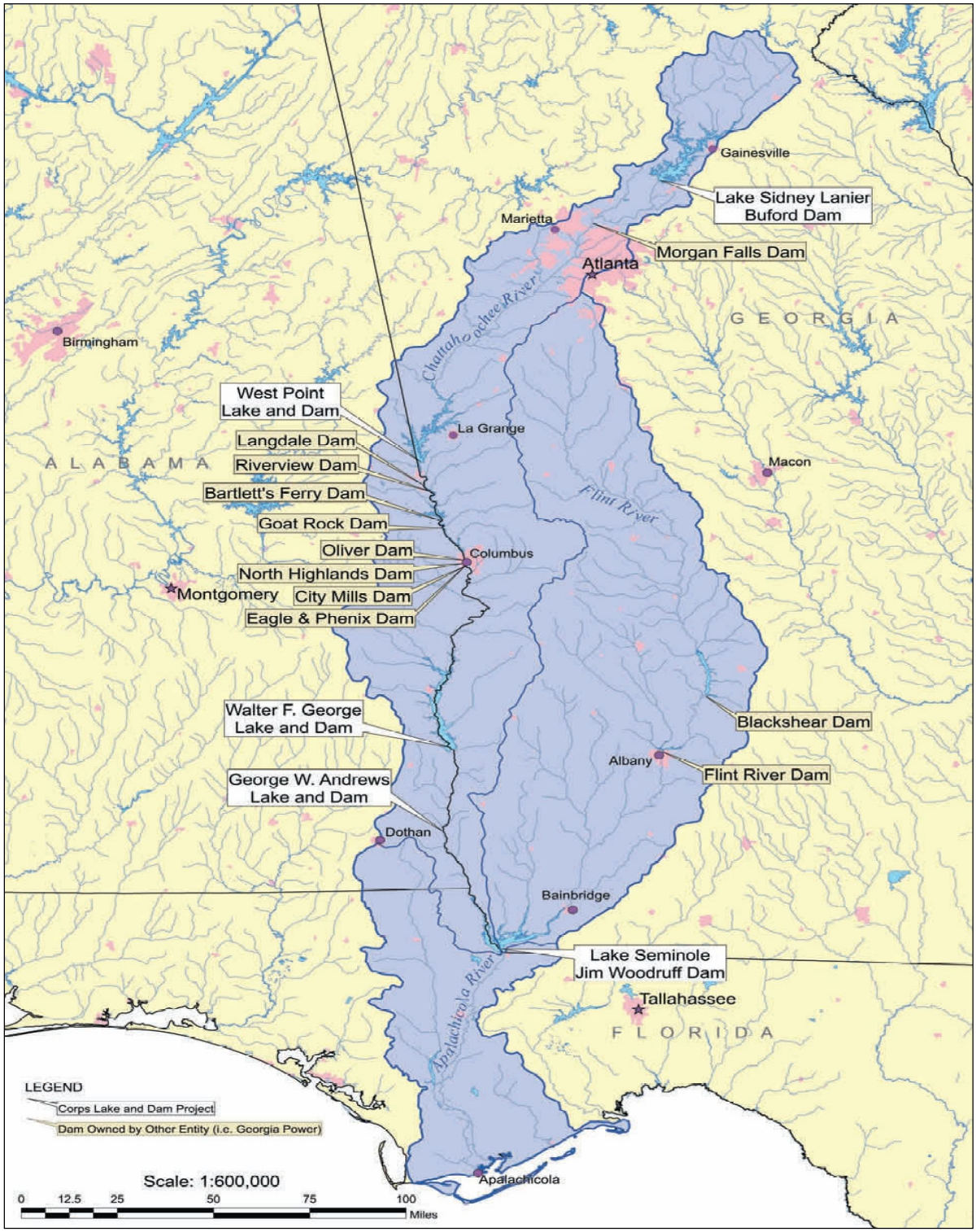

Figure 2. ACF WSSA Study Area

3.0 PROBLEMS AND NEEDS

Georgia's 2013 request stated that 3.3 million Georgians now rely on withdrawals or releases from Lake Lanier for water supply and that by 2040 approximately six million people will rely on Lake Lanier for water supply. This request has been updated in December 2015 which revised the request through 2050. This request projected a need for 621 mgd that would be met by Lake Lanier either through releases for downstream consumption (355 to 379 mgd) or from direct withdrawals from the lake (242 mgd). Based on the legal analysis the downstream needs can be met as part of the authorized project purpose and do not require a water supply storage agreement. The analysis in the WSSA, therefore assumes that releases from Buford Dam sufficient to satisfy that demand would be met.

3.1 Current and Future Lake Users

Water supply providers currently withdrawing from Lake Lanier include the City of Buford, City of Cumming, Forsyth County, City of Gainesville, and Gwinnett County. Water withdrawals by these entities in 2000 – 2011 are displayed in Table 1 below. The greatest demand for water in the ACF System as a whole occurred in 2007. In 2007, the average water withdrawn directly from Lake Lanier was 128 mgd. In addition to the entities listed above that currently withdrawal from Lake Lanier, Georgia's 2015 request indicated that Habersham, White, and Lumpkin counties will also be likely future users of Lake Lanier. Withdrawals shown in Table 1 include those authorized under relocation agreements (Buford and Gainesville).

Table 1. Lanier Annual Direct Water Withdrawals 2000-2011

	Direct Water Withdrawals (mgd)											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Buford	1.37	1.24	1.29	1.40	1.43	1.44	1.53	1.47	1.31	1.22	1.27	1.29
Cumming	11.58	12.35	10.34	10.80	11.16	10.51	11.95	11.65	10.93	10.92	11.42	11.58
Forsyth County	3.38	3.60	5.42	4.12	5.70	6.50	6.83	8.44	4.90	6.26	7.78	8.63
Gainesville	18.27	17.50	17.32	16.85	17.73	17.87	19.00	18.76	16.37	16.65	17.53	17.66
Gwinnett County	85.13	85.73	83.67	76.37	84.39	83.58	92.67	88.27	73.59	72.77	75.52	76.19
Total	119.73	120.42	118.03	109.54	120.41	119.91	131.98	128.58	107.09	107.81	113.51	115.34

Source: USACE. 2014

Water supply demand has been projected for the Atlanta metro area in the Metropolitan North Georgia Water Planning District (MNGWPD) Water Supply, and Conservation Management Plan. Forecasts were made through 2035 and 2050. The 2015 revised request from the State of Georgia provided updated forecasts provided by the Atlanta Regional Commission (ARC) as an attachment to their request. These forecasts did not

include Habersham, White, Dawson, and Lumpkin Counties which, based on Georgia's 2013 request, have a need of 41 mgd. The revised forecast included in a December 2, 2015 memorandum to Jud Turner updated the need to 8 mgd, but only for Habersham, White, and Lumpkin counties. This memorandum indicated that Dawson County would have no unmet water supply needs in 2050. Accordingly, Dawson County would not need a reallocation of storage in Lake Lanier. Together with the ARC forecasts, the total need identified through 2050 was 242 mgd which could be met by withdrawals from Lake Lanier. A supplemental water demand forecast was completed by USACE to verify the stated needs provided in the Georgia 2015 request. The USACE forecast is discussed in Section 3.3 Water Demand Analysis.

3.2 Current and Future Downstream needs from Lake Lanier

Water withdrawals by Metro Atlanta water supply providers occurring downstream of Buford from 2000 – 2011 are displayed in Table 2 below. As stated previously, 2007 represented the greatest demand for water in the ACF System as a whole. In 2007, the average water withdrawn from the Chattahoochee River was 275 mgd. MNGWPD also projected water supply demand for the Metro Atlanta area through 2050. River withdrawals by the Metro Atlanta water supply providers are expected to increase from 275 mgd to 379 mgd by 2050.

Georgia's 2015 request identified a need to withdraw between 355 and 379 mgd from the Chattahoochee River between Buford Dam and the confluence of the Chattahoochee River and Peachtree Creek by 2050. Based on the 2012 Legal Opinion discussed above, releases from Buford Dam to provide for withdrawal of 379 mgd are authorized by the River and Harbor Act of 1946. Accordingly, analyses of potential reallocation will take into account that authorized withdrawals will be made by Metro Atlanta water supply providers in the amount of either 277 mgd (current need) or 379 mgd (future need).

Table 2. Downstream Annual Metro Atlanta Water Withdrawals 2000-2011

	Withdrawals from Chattahoochee River (mgd)											
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
City of Atlanta	106.83	101.93	101.17	95.47	96.61	100.47	102.54	100.90	87.78	82.31	84.10	89.17
Atlanta-Fulton Co. Water Res. Commission	42.62	43.90	43.39	40.12	40.99	42.80	43.76	44.07	36.07	37.09	40.15	38.67
DeKalb County Public Works	94.18	87.89	87.38	82.23	83.98	83.05	82.81	78.36	72.58	73.85	74.95	72.68
Cobb County Marietta Water Authority	47.04	42.93	43.45	41.73	46.85	46.95	51.00	52.14	43.69	43.57	43.28	45.12
Total	**291**	**277**	**275**	**260**	**268**	**273**	**280**	**275**[6]	**240**	**237**	**242**	**246**

Source: USACE 2015

Analyses of water supply options discussed below were accomplished using ResSim modeling and 2007 withdrawals basin-wide were used to reflect the No Action Alternative as discussed in Sections 5 and 6 in the EIS. Modeling of other water supply options considered changes in withdrawals either from Lake Lanier or from the Chattahoochee River, or both while all other withdrawals throughout the basin were held at 2007 levels.

3.3 Water Supply Demand Analysis

The purpose of this water supply demand analysis is to assist in making an informed independent estimate regarding future water supply demand in order to determine whether it would be in the public interest to reallocate storage to water supply. A secondary purpose is to determine the reasonableness of Georgia's stated water need from Lake Lanier. Water demand has been forecasted at the county-level in an effort to provide useful information on trends in current and future water use. The forecast begins with baseline demands (2010[7]) and projects these demands through the year 2070 in 10-year increments using a computational "driver times rate of use" approach. This approach multiplies a water use factor by the projected number of future users to estimate future water demands. A water demand forecast model tool was developed based on 2010 United States Geological Survey county level sector production data, demographic data, socioeconomic data, and historical agricultural data. The basic methodology of the water demand model is to estimate water demand separately for each water use category, also referred to as a water use sector. The methodology selected to forecast water demand for each sector is determined by data availability.

[6]In the RESSIM model, 277mgd was used as the gross river withdrawal value for 2007. 277 mgd was a carryover value from when modeling originally began and is representative of current river withdrawals.
[7] 2010 is the latest year for which data was available. USGS typically publishes data in 5 year intervals.

This is the case for all sectors of this report. The sectors determined to be relevant to the study area are listed below.

Sectors:

1. Domestic
2. Non-Residential
3. Irrigation-Crops
4. Irrigation-Golf
5. Agriculture-Livestock
6. Aquaculture

For each sector, the basic methodology for estimating water demand is to calculate a product of the driver and the rate of use. The driver is defined as a countable unit driving water demands up and down, which can be projected in future years, such as population or number of households, number of acres irrigated, number of employees in a business, etc. The rate of use is defined as the quantity of water used by the driving unit, such as gallons per person per day, gallons per household, or ac-ft per irrigated acre.

Based on the 2010 USGS data mentioned above, the residential sector portion of the projection model was developed using a per capita water demand forecast. The non-residential and agricultural portions of the forecast were developed utilizing a unit use approach to estimate future demands. The per unit water use rate, or water use factor, can be developed for most sectors given historical or current water use data and a defined demographic unit. Projection of future water demand then requires having projected values of the defined demographic unit. With this approach, the water use factor of each sector can be assumed to either remain constant into the future, decrease over time due to increases in water use efficiency, or increase over time due to more intensive water use.

The county-level water demand forecasts presented in this report are contingent upon a number of assumptions. These assumptions include the following:

- Residential water use in each county will maintain the current average rate of water use per capita (weighted average of 87 mgd based on 2010 USGS data).
- Self-supplied residential water use in 2010 was 75 gallons per day (GPD) for the entire study area.
- The ratio of self-supplied population to system-served population for each county will remain constant into the future at current levels.

- Future employment growth for each county will maintain the current proportion by North American Industrial Classification System (NAICS) classifications.
- Water use per employee into the future will maintain the current average rate of use per employee per NAICS group.
- Water use for livestock will remain at current levels per animal.
- Water use per crop type will remain at current levels per acre.
- Water use efficiency and irrigation type by county will remain at current levels.
- Weather conditions are not addressed in this study.
- System losses among public and rural water district systems are not accounted for in this study.
- The rates of water use per unit for each sector do not account for future improvements in water use efficiency (i.e., water conservation).

All population forecasts are based on growth rates produced by the Georgia Office of Planning and Budget March 12, 2010 report (2010-2030), the average forecasted growth rates for the 7-county study area ranged from 2.0 percent – 3.9 percent. The population forecast for this report used a low, medium, and high scenario. The medium growth forecast is displayed in Table 3.

Table 3. Medium Annual Growth (2.9 percent) Population Forecast

County	2010	2020	2030	2040	2050	2060	2070
Publicly Supplied							
Dawson	16,370	21,787	28,997	38,593	51,365	68,362	90,985
Forsyth	173,290	230,636	306,959	408,540	543,737	723,673	963,155
Gwinnett	700,510	932,327	1,240,857	1,651,489	2,198,008	2,925,385	3,893,470
Habersham	27,670	36,827	49,014	65,233	86,821	115,552	153,791
Hall	151,820	202,061	268,928	357,924	476,370	634,012	843,823
Lumpkin	10,320	13,735	18,280	24,330	32,381	43,097	57,359
White	14,000	18,633	24,799	33,006	43,928	58,465	77,813
Self -Supplied							
Dawson	5,960	7,932	10,557	14,051	18,701	24,889	33,126
Forsyth	2,221	2,956	3,934	5,236	6,969	9,275	12,344
Gwinnett	104,811	139,496	185,658	247,097	328,868	437,699	582,545
Hall	27,864	37,085	49,357	65,691	87,430	116,362	154,870
Habersham	15,371	20,458	27,228	36,238	48,230	64,191	85,433
Lumpkin	19,646	26,147	34,800	46,316	61,644	82,043	109,193
White	13,144	17,494	23,283	30,988	41,242	54,890	73,055

3.3.1 Residential (Domestic)

All data for the residential sector of this study, which includes indoor use such as bathing, toilet flushing, clothes washing, dish washing, and other appliances, and outdoor uses such as lawn irrigation and car washing, was collected from USGS county level report (2010 Preliminary Report). Data was reported as total withdrawals from ground water and surface water sources. The data included breakouts of population receiving water either from the ground source or surface source (public supply). From this data the per capita use per day was determined. The remaining population, once public supply was removed from total population is assumed to be self-supplied. Residential growth scenarios are displayed in Tables 4 and 5. Table 5 shows public supply only.

- Per Capita Use Determination:
- Population Served by Public Supply (Surface +Groundwater)-Total Population =Domestic Users
- Domestic Per Capita use: Total Domestic Water Use/Domestic Users. (GPD)

- Total Population-Population served by Public Supply =Self Supplied Users
- Self-Supplied Water Usage: Self-Supplied water use in 2010 averaged 75 GPD. This rate is held constant for all counties, and was determined by previous USGS studies.

Table 4. Residential Medium Growth (2.9 percent) Demand Total

	Residential Public + Self-supplied(mgd)					
County	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Dawson	2.88	3.84	5.11	6.80	9.04	12.04
Forsyth	17.06	22.70	30.22	40.22	53.52	71.24
Gwinnett	90.64	120.64	160.56	213.69	284.41	378.53
Habersham	7.10	9.44	12.57	16.73	22.26	29.63
Hall	18.54	24.68	32.84	43.71	58.18	77.43
Lumpkin	4.93	6.56	8.73	11.62	15.46	20.58
White	3.75	4.99	6.65	8.85	11.78	15.67

Table 5. Residential Public Supply Medium Growth (2.9 percent) Demand Total

	Residential Public Supply(mgd)					
County	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Dawson	2.29	3.05	4.06	5.40	7.17	9.56
Forsyth	16.84	22.40	29.83	39.70	52.82	70.31
Gwinnett	80.18	106.72	142.03	189.02	251.58	334.84
Habersham	5.57	7.40	9.85	13.11	17.45	23.22
Hall	15.76	20.98	27.91	37.15	49.45	65.81
Lumpkin	2.97	3.95	5.26	7.00	9.31	12.39
White	2.44	3.24	4.33	5.76	7.66	10.19

3.3.2 Non-Residential Water Use

For the non-residential sector (hospitals, schools, industrial business, retail, etc.) the factors that influence demands vary widely; therefore, it was determined that a per unit use approach would best capture water use in the non-residential sector. For non-residential water users, the rate of water use per employee is unique to the type of establishment and the type of work being performed. e.g., water use per employee would be significantly higher at a restaurant where water is being used to wash dishes and prepare food than at a retail store where water use is for sanitary purposes. The non- residential water coefficients contain average gallons of water use per employee

per day (GED) for each NAICS category. The water use coefficients represent all water used at a given establishment on an average day divided by the number of employees.

After literature review of NAICS water use coefficients from previous studies it was determined, the coefficients recently developed for Southwest Missouri Water Resource Study are a realistic representation of water usage in the 7-county study area. The coefficients were developed using IWR-Main[8] methodology and are considered the best predictors of water usage available without developing study specific coefficients for the seven-county area. The following industrial NACIS codes and GPD/Employee were captured in this study and displayed in Table 6.

Table 6. Gallons per Day Values by Industry

NAICS Sectors		GPD/Employee
11	Agriculture, forestry, fishing and hunting, and mining	112
23	Construction	67
31	Manufacturing	145
42	Wholesale Trade	44
44	Retail Trade	46
48	Transportation and Warehousing, and Utilities	57
51	Information	28
52	Finance and Insurance, and 53-Real Estate and Rental and Leasing	60
54	Professional, Scientific, and Management, and Administrative and Waste Management Services	69
61	Educational Services, and Health Care and Social Assistance	104
71	Arts, Entertainment, and Recreation, and Accommodation and Food Services	33
81	Other Services, Except Public Administration	74
921190	Public Administration	74

Non-residential water use is displayed in Table 7 for the medium growth scenario which is the baseline scenario.

[8]IWR-Main Water Demand Management Suite: The IWR-Main Water Demand Management Suite is a computerized water resource planning tool that allows the development of water use forecasts and the evaluation of water conservation programs using a combination of econometric demand models and single coefficient requirements models.

Table 7. Non-Residential Water Use (mgd)
Medium (2.9 percent) Growth Rate

County	2020	2030	2040	2050	2060	2070
Dawson	0.97	1.3	1.71	2.28	3.03	4.04
Forsyth	8.02	10.7	14.21	18.91	25.17	33.49
Gwinnett	37.56	50.0	66.54	88.55	117.86	156.86
Habersham	1.92	2.6	3.40	4.52	6.02	8.01
Hall	8.98	12.0	15.91	21.17	28.18	37.51
Lumpkin	1.37	1.8	2.42	3.22	4.29	5.70
White	1.18	1.6	2.09	2.78	3.69	4.92

3.3.3 Agricultural Demand

Agricultural demand is broken out between water supplied for livestock and water supplied for crop irrigation. The annual gallons forecasted for the Livestock sector was developed by taking the number of animals per county, as reported by the 2012 Agriculture Census, and multiplying by the required water needed per animal. Annual usage is then calculated by multiplying daily water required by 365 days. The exception to this is the poultry industry, where a 285-day season is used to account for time between flocks. Analysis of agriculture data is for the historical period from1997-2012. The largest sector within the agriculture industry is the poultry industry; this sector consumes approximately 70 percent of all water in the counties where the industry is present. The water usage for this industry is determined by a number of factors including: temperature, grow-out methods, management etc. There is substantial variance in the poultry population from year to year, and after analysis of the 1997-2012 data it was determined that a 25 percent + and – variance in baseline agriculture water usage would be included in this study for reference. The agriculture sector water usage was based on the numbers of animals reported in the 2012 agriculture census. This data is considered the most relevant to date. Estimated water use for livestock will be held constant throughout the study period.

Table 8. Livestock Water Use

		Variance From Baseline	
County	Total mgd	-25 percent	+25 percent
Dawson	0.391731	0.293798	0.489664
Forsyth	0.198834	0.149125	0.248542
Gwinnett	0.019971	0.014978	0.024963
Habersham	0.868041	0.651031	1.085051
Hall	0.855528	0.641646	1.069410
Lumpkin	0.259602	0.194702	0.324503
White	0.493533	0.370150	0.616917

The baseline developed for the crop irrigation is based on USGS 2010 reported water data and irrigated acres. All counties in the study area reported irrigated acreage with Habersham County reporting the highest acreage with 290 irrigated acres, and White County reporting the lowest acreage with 40 acres. Gallons per acre for crop irrigation were established by dividing the 2010 USGS reported agricultural water usage per county by total reported acreage. The gallon per acre was then multiplied by anticipated growing/irrigation season of 122 days. After review of previous data obtained from the Agriculture Statistical Service and data provide by USGS for the year 2010 it was determined to hold the acreage constant for the 50-year study period.

Table 9. Water Use for Crop Irrigation

County	Crop Acres Irrigated in 2010	Total MG	Gallons/Acre	Gallons/Day	mgd
Dawson	180	0.09	500	738	0.000738
Forsyth	180	0.30	1667	2459	0.002459
Gwinnett	0	0	0	0	0.000000
Habersham	290	0.11	379	902	0.000902
Hall	110	0.28	2545	2295	0.002295
Lumpkin	110	0.12	1091	984	0.000984
White	40	0.05	1250	410	0.000410

3.3.4 Irrigation-Golf Sector

Analysis for the golf sector of the report is based on 2010 USGS preliminary data. The analysis provides estimates in an average rainfall year and in a dry year. These numbers are representative of the Georgia golf course turf water use. The USACE analysis of the 2010 data set provided by USGS was procedurally the same as the 2005 Georgia EPD Golf Study. The results of both studies were examined and all current water use, (with the exception of Habersham County which fell below the average calculated amount) falls between the average and dry year scenario. After review of the data sets provided by USGS and the EPD Golf course study it was decided that the median water use of 1,699 gallons per day per acre would be applied to all counties and annual water usage for each county would be dependent on the number of irrigated acres in the county. The acreage reported by the 2005 and 2010 data sets revealed only a slight change in acreage; therefore, each county acreage will be held constant with the 2010 reported numbers. The annual water usage coefficient used in this analysis for forecasting is based on median water use per acre in all counties. Annual usage is median daily use multiplied by the estimated 214-day irrigation season. Procedures and Assumptions are based on the following study: Water Use for Georgia

Agricultural (Farm Use) Withdrawal Permitted –Golf Courses; Cliff Lewis, Georgia EPD, Tifton, Georgia.

For each county, the "average rainfall year" water use was calculated by multiplying the total number of permitted acres by 14.06 acre-inches. This calculation provided the total acre-inch water use in a year of average rainfall, for an April 1 – October 31 growing season. For each county, the "Dry year (no rainfall)" water use was calculated by multiplying the total number of permitted acres by 30 acre-inches. This calculation provided the total acre-inch water use in a dry year of no rainfall, for an April 1 – October 31 growing season. Water use for golf courses is detailed in Table 10.

Table 10. Water Use for Golf Courses

County	Total Usage	USGS Reported Acreage (2010)	Water Use (Average rainfall year) GPD	Water Use (Dry-No rainfall year) GPD	Average -year mgd	Dry-year mgd	mgd
Dawson	0.21	120	125518.435	267820.274	0.13	0.27	0.20
Forsyth	0.28	170	177817.783	379412.055	0.18	0.38	0.29
Gwinnett	1.85	1000	1045986.959	2231835.616	1.05	2.23	1.70
Habersham	0.16	180	188277.653	401730.411	0.19	0.40	0.31
Hall	1.26	690	721731.0016	1539966.575	0.72	1.54	1.17
Lumpkin	0.16	100	104598.696	223183.562	0.10	0.22	0.17
White	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.3.5 Total Projected Water Demand

After analysis of all available data it was determined the medium growth rate scenario of 2.9 percent for population growth for the Residential and Non-Residential sectors; with the remaining sectors per unit usage held constant throughout the study period would best represent the water demand for the study area. Table 11 illustrates total demand forecasted by county for all water use sectors.

Table 11. Total Demand Forecast for Medium Growth Scenario

Total Water Demand Estimate at 2.9 percent Growth Rate						
County	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Dawson	4.45	5.72	7.42	9.67	12.67	16.67
Forsyth	32.10	40.40	51.44	66.14	85.71	111.75
Gwinnett	129.92	172.35	228.82	303.97	403.99	537.11
Habersham	14.80	17.78	21.75	27.03	34.06	43.42
Hall	30.54	39.65	51.77	67.91	89.38	117.96
Lumpkin	6.72	8.81	11.58	15.27	20.18	26.71
White	5.42	7.06	9.23	12.12	15.96	21.08
Total*	223.96	291.76	382.00	502.11	661.96	874.71

* Includes 12 MGD for aquaculture demand held constant through-out the period of analysis.

3.3.6 Projected Water Demand for M&I

Based on this independent analysis of water supply demand, the projected M&I water demand for the current and potential future Lake Lanier users are displayed Table 12. Projected M&I water demand for 2050 is approximately 483 mgd which exceeds Georgia's 2015 request. Although USACE did not have the benefit of the assumptions used by the State of Georgia in developing their water demand forecast, this analysis confirms and validates the need for water supply as requested by the State of Georgia. Demonstrating need is a requirement for consideration of reallocating storage

Table 12. Municipal and Industrial Total Water Use Medium Growth (2.9 percent)

Counties	**2020**	**2030**	**2040**	**2050**	**2060**	**2070**
Dawson	3.85	5.12	6.82	9.08	12.08	16.08
Forsyth	25.08	33.38	44.42	59.12	78.69	104.73
Gwinnett	128.20	170.63	227.10	302.25	402.27	535.39
Habersham	9.01	12.00	15.97	21.25	28.28	37.64
Hall	27.52	36.63	48.75	64.89	86.36	114.94
Lumpkin	6.29	8.38	11.15	14.84	19.75	26.28
White	4.93	6.56	8.73	11.62	15.47	20.59
Total	204.89	272.70	362.94	483.04	642.89	855.64

4.0 WATER SUPPLY ALTERNATIVES

4.1 Preliminary Alternatives

An array of potential sources for water supply for those water supply providers currently withdrawing from Lake Lanier is summarized as follows:

- Conservation
- Groundwater
- Desalination
- Existing surface water sources (other than Lake Lanier)
- Reallocation from Flood Control Storage
- Reallocation from Inactive Storage
- Reallocation from Conservation Storage
- New Reservoir Construction
- Chattahoochee River Withdrawal and Pumping

4.2 Future Without Project Condition

The Future Without Project Condition (FWOPC) is the condition expected to exist in the future in the absence of reallocation of storage under the 1958 Water Supply Act for those communities currently withdrawing water from Lake Lanier under expired agreements. The FWOPC provides the basis from which alternative plans are formulated for the WSSA. In the FWOPC releases would be made from Buford Dam to support the 2007 downstream withdrawals of 379 mgd. The FWOPC is the same as Alternative 7J (Alt7J) in the EIS.

4.3 Alternatives Considered but Eliminated from Further Consideration

4.3.1 Conservation

Conservation is often the first step in reducing consumption and overall demand for water supply. Water providers within the district have been implementing multiple conservation measures to reduce demand. Conservation has been an important focus of the MNGWPD and is included as a cornerstone of their water supply plan. Measures include conservation pricing, leak detection and repair, plumbing and toilet retrofit programs, education programs, multi-family sub-metering, and water recycling (e.g. car washes). In 2011 per capita water use for the metro area was 148 gpcd (gallons per capita per day). GAEPD projects water use will decrease to an average of 135 gpcd by 2040. In a December 2, 2015 memorandum from MNGWPD to Jud Turner, it is stated that the overall per capita use from has declined 30 percent since 2000. It is unlikely that additional conservation measures would result in a significant reduction in Georgia's 2050 need. To the extent that the MNGWPD adopts additional conservation measures, Georgia's 2015 request will satisfy needs beyond 2050.

4.3.2 Groundwater

Following the Phase I ruling of the Federal District Court for the Middle District Court of Florida in July 2009, the State of Georgia created the Water Task Force to develop a contingency plan to prioritize a set of water conservation and water supply options. The report detailed options for meeting the water supply needs of current and future Lake Lanier users if water withdrawals from Lake Lanier and releases from Buford Dam were halted. The report was prepared by a collection of A-E firms and stakeholders. In the Georgia Water Task Force Report that was completed in 2009, ground water was evaluated as a potential option to meet the water supply needs of the stakeholders. The potential ground water sources identified were either for non-potable reuse or were located in isolated areas and in relatively small quantities and would not be readily available to water supply systems dependent on Lake Lanier. Groundwater resources in MNGWPD are limited in quantity and are quite costly compare to other options, therefore, are not considered adequate potential sources of water supply and were eliminated from further evaluation.

4.3.3 Desalination

The Georgia Water Task Force Report evaluated desalination as a potential option to meet the water supply needs of the stakeholders. The study showed an estimated cost of approximately $21 billion over the project life. While the preliminary evaluation showed that this option could supply approximately 200 mgd, this was seen as the most expensive option and, therefore, is not carried forward in our evaluation.

4.3.4 Existing Surface Water Sources (other than Lake Lanier)

The Georgia Water Task Force Report also evaluated the feasibility of existing surface water sources to meet the need if Lake Lanier and Buford Dam could no longer be operated for water supply. Potential sources include Lake Burton, West Point Lake, Lake Hartwell, and Nickajack Reservoir. Several of these sources would require inter-basin transfer agreements or legislation. Further, based on information in the report, none of these sources would satisfy the 2040 water supply need. All of these transfers were considered contentious or highly contentious by the stakeholders involved. Additionally, obtaining water from another USACE reservoir would require reallocation of storage. Existing surface water sources were not carried forward for further evaluation.

4.3.5 Reallocation from Flood Control Storage and Inactive Storage

Flood storage at Buford Reservoir exists between elevations 1071 and 1085 and consists of 602,000 ac-ft. Reallocation from the flood pool could accommodate a portion of the future demand; however, this alternative will not be carried forward for further evaluation for several reasons:

- A preliminary analysis examined the feasibility of a mixed pool reallocation considered a two foot raise of the conservation pool. This pool raise increased the yield by 1.8% but reduced the flood storage by 7.2%. This was not supported as is it was not an efficient use of flood storage reduction.
- Reallocation from the Lanier flood pool would represent an increased flood risk because compromised downstream channel capacity and development encroachment restrict flood water releases from Buford Dam to 10,000 cfs. Because flood releases must be limited to 10,000 cfs, it is necessary to maintain maximum amount of flood storage availability.
- The Buford Dam DSAC classification was lowered from a DSAC of 4 to a DSAC of 3. The DSAC classification was lowered due to saddle dike leaks as well as potential consequences. The population at risk includes residents downstream in metro Atlanta. Infrastructure including main roadways (I-85) would also be at risk. Current USACE policy prohibits pool raises with a DSAC classification of 3 or lower. Reallocation from Flood Control pool would not be supported given the current DSAC classification.
- Incursions into the flood control pool would cause impacts to recreation facilities. Reallocation from Flood Control pool was not screened out solely because of these potential impacts as USACE maintains flood easements up to 1085; however it was a consideration along with other factors.

Reallocation from inactive storage was considered and eliminated from further consideration because the Buford hydropower project is designed with head limits at the bottom of the conservation pool. The design of hydropower equipment at Buford Dam is optimized to function within the head range which corresponds to the conservation pool. Operation below the minimum rated head (bottom of conservation pool, inactive pool) would result in excessive cavitation and often vibration which could damage equipment. In addition operation in this range would decrease the efficiency and output of the unit.

4.4 Action Alternatives

The following alternatives are considered to satisfy some or all of the water supply need for users upstream of Buford Reservoir. The projected need of 379 mgd for downstream users would be met regardless of which of these alternatives might be implemented.

4.4.1 Reallocation from Conservation Storage

Varying levels of reallocation from conservation storage at Lake Lanier were evaluated in the EIS including the following:

- Current (2007) withdrawals (128 mgd), including 20 mgd for relocation contracts. (108 mgd would be considered for reallocation under the authority of the 1958 WSA).
- 242 mgd (Georgia's 2015 request, including 20 mgd relocation contracts and 222 mgd under the authority of the 1958 WSA).
- 185 mgd (including 20 mgd relocation contracts and 165 mgd under the authority of the 1958 WSA).
- 225 mgd (including 20 mgd relocation contracts and 205 mgd under the authority of the 1958 WSA).

4.4.2 New Reservoir Construction

Under this alternative several new water supply reservoirs would need to be developed upstream of Lake Lanier or on a tributary to Lake Lanier. At this time specific sites have not been identified. The location, size, pump capacity, hydrologic information, and safe yield for any individual reservoir cannot be determined without a much more detailed study that would accompany actual pursuit of such an option. Costs for this alternative were based on recently constructed or proposed reservoirs and are discussed in Section 6 of this assessment (refer to Table 19). Figure 3 displays a conceptual map of the location of these new reservoirs. It is not known if incremental water treatment and wastewater treatment costs would be incurred by implementing this option.

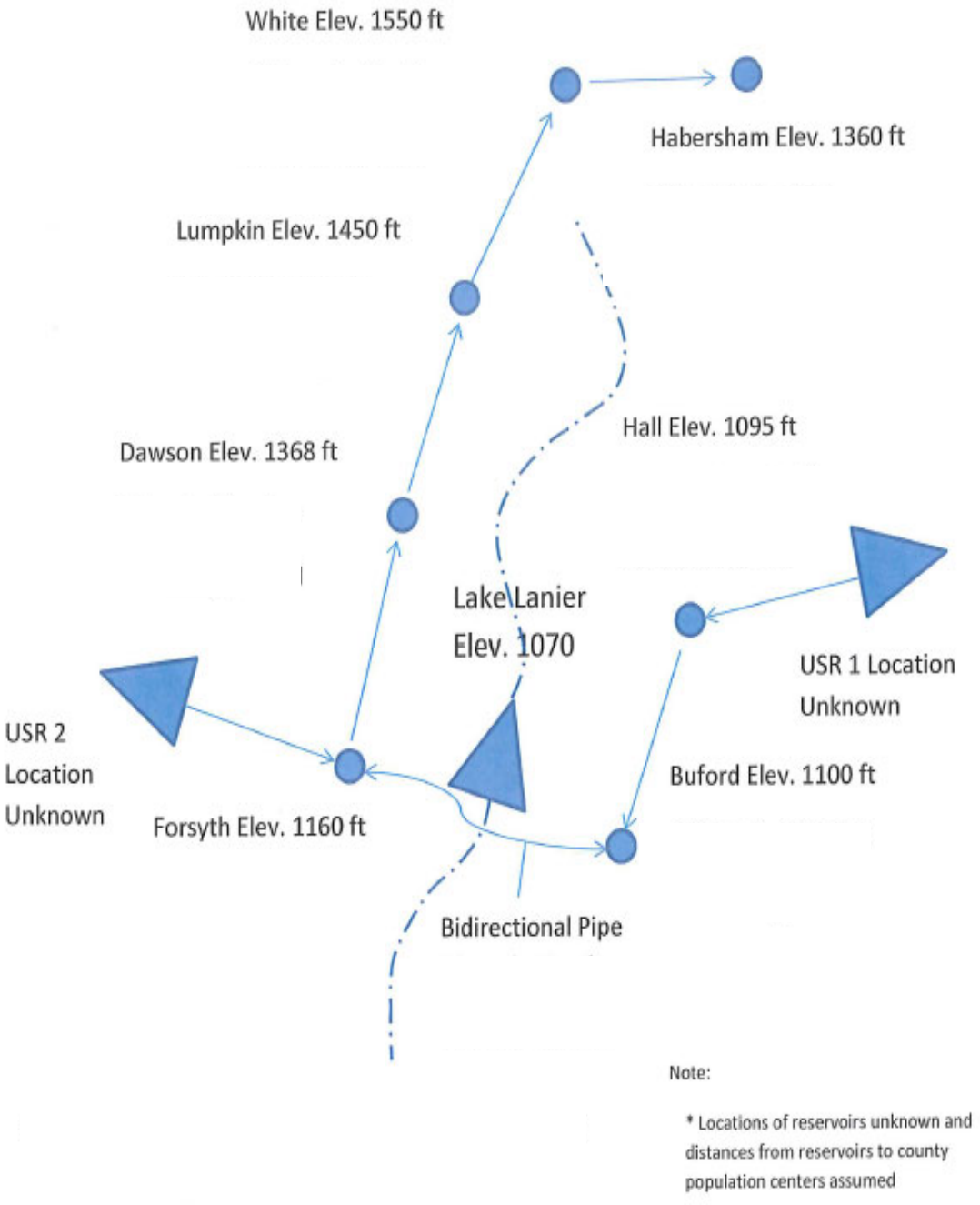

Figure 3. New Reservoir Conceptual Locations
Source: Georgia EPD, 2014

4.4.3 Chattahoochee River Withdrawal and Pumping System Alternative

Another alternative considered would involve constructing new intakes for withdrawing water from the Chattahoochee River downstream of Buford Dam and pumping it upstream for use by users that otherwise would withdraw directly from Lake Lanier.

It is assumed that a pipeline would be constructed on the eastern side of the Chattahoochee River to carry water to meet the water supply needs of Gwinnett County, City of Buford, Hall County, and City of Gainesville, and that a pipeline would be constructed on the western side of the Chattahoochee River to meet the needs of Forsyth County, City of Cumming, Dawson County, Lumpkin County, White County, and Habersham County. It is not known if incremental water treatment and wastewater treatment costs would be incurred by implementing this option.

The cost of this option would result from piping systems and associated pump stations. (Refer to Table 19) It is assumed the location of the pump station to be Georgia Power Company's Morgan Falls Dam. A potential piping configuration is shown in Figure 4.

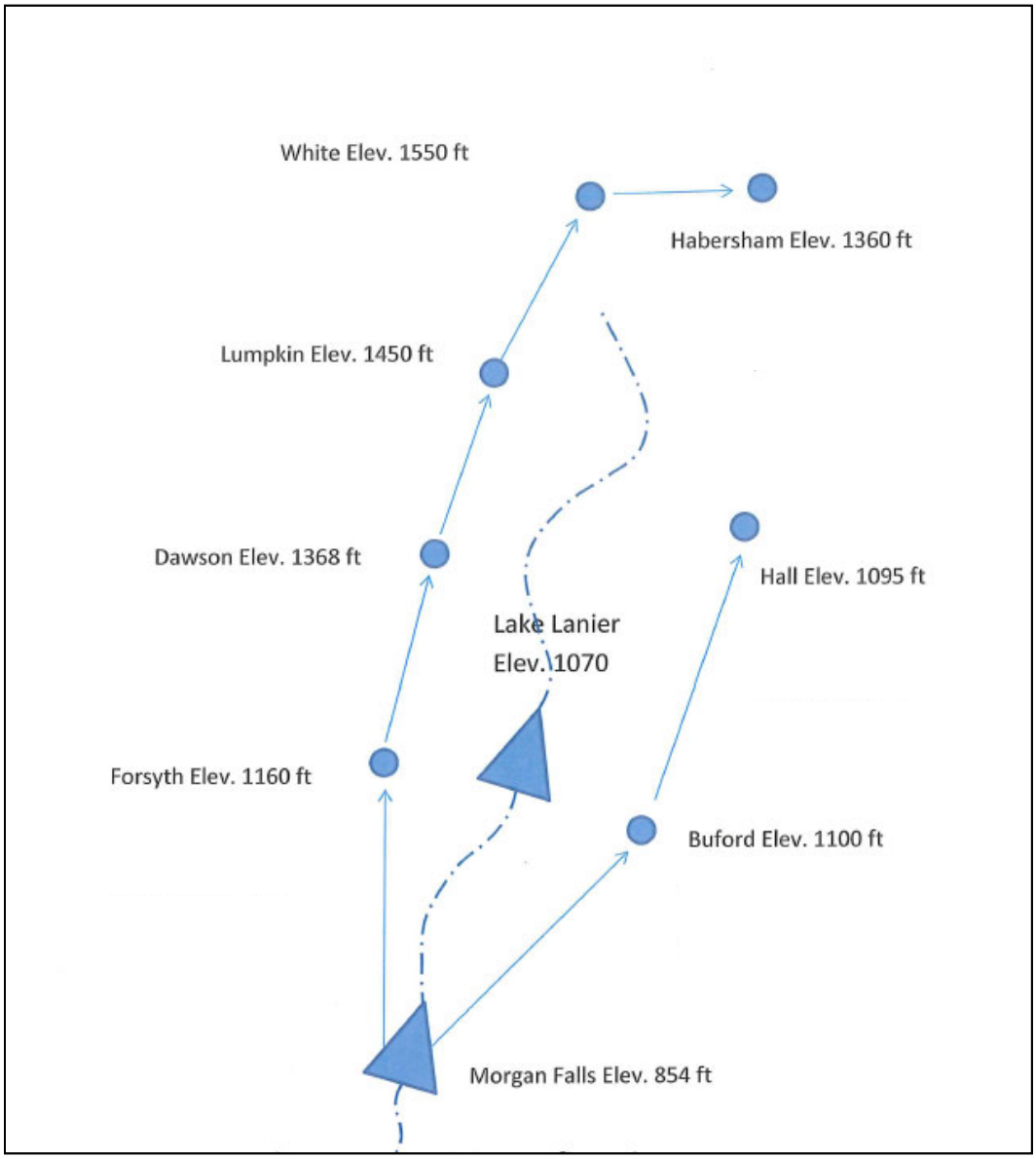

Figure 4. Conceptual Map of Chattahoochee River Withdrawal and Pumping Alternative
Source: Georgia EPD, 2014

4.5 Alternative Evaluation

In order to evaluate the impacts for the varying levels of reallocation considered, the varying levels of water supply were modeled as part of the ResSim Analysis. The USACE Hydrologic Engineering Center (HEC) developed ResSim, the software that is now the standard for USACE reservoir operations modeling. The software incorporates characteristics of the basin and individual reservoirs including physical constraints (spillway capacities, area-discharge curves, flows associated with hydroelectric power

generation, and such) and operational procedures (action zones, balancing, and the like). For further description refer to Section 4.1 of the EIS. ResSim provides outputs in terms of reservoir levels, river flows, hydropower generated over the historical period. A full discussion of the complete water supply and water management alternatives is presented in Section 5 of the EIS. Environmental impacts analyses are discussed in Section 6 of the EIS.

4.6 Proposed Action Alternative

Based on the results from the impacts analysis in the EIS, the Proposed Action Alternative has a gross withdrawal amount of 242 mgd which includes, a reallocation of 222 mgd or 254,170 acre feet, 20 mgd for relocation agreements). This storage reallocation will also accommodate the current need of 128 mgd from Lake Lanier. This alternative will provide for 379 mgd downstream of Atlanta. The rationale for selecting the Proposed Action Alternative is discussed in more detail in Section 5.3 of the EIS.

5.0 DERIVATION OF USER COST

5.1 Methodology

USACE's Engineer Regulation (ER) 1105-2-100 specifies the four pricing methods used to calculate the value of storage considered for reallocation (i.e., the price to be charged for the capital investment for the reallocated storage). The four methods include: benefits foregone, revenues foregone, replacement cost, and updated cost of storage. The value placed on the storage is the highest of the four methods.

- Benefits Foregone. Benefits foregone are generally estimated using the standard National Economic Development (NED) evaluation criteria in compliance with ER-1105-2-100. The benefits forgone are evaluated over a 50-year period of analysis.
- Revenues Foregone. Hydropower revenues foregone are defined as the reduction in revenues accruing to the Treasury as a result of reallocating storage from hydropower to water supply. The revenues are based on the existing repayment agreement between the power marketing agency and the USACE. Revenues forgone from other project purposes are the reduction in revenues accruing to the U.S. Treasury based on existing repayment agreements.
- Replacement Cost. Notwithstanding unforeseen circumstances, replacement costs are equal to benefits foregone. In the event that reallocated storage is being taken from the flood control pool, the USACE will estimate the replacement cost of equivalent protection.

- Updated Cost of Storage. The updated cost of reallocated storage is estimated by updating the cost of the joint use features from the midpoint of construction to the fiscal year in which the reallocation of storage is approved. The updated cost of the joint use features is then multiplied by the proportion of useable storage that is to be reallocated to estimate the value of the reallocated storage.

If the cost of reallocated storage is less than the cost of the most likely alternative non-Federal source of water supply, the reallocation is considered to be feasible. The reallocation is feasible because, net marginal benefits associated with water supply are greater than benefits associated with the displaced project purpose (USACE, 2000).

5.2 The Value of Storage

5.2.1 Benefits Forgone

Benefits forgone are calculated for the ACF Federal project in accordance with guidance in the ER 1105-2-100. There are no benefits forgone calculated for flood risk management or from navigation. Because there was no change in the level of flood risk management and the reallocation considered is out of the conservation pool, there are no benefits forgone for the flood control project purpose. While there is improved channel availability on the ACF System, no NED benefits were evaluated due to the lack of consistent commodity movements over the last decade. Therefore, there are no benefits forgone to the navigation project purpose.

Benefits forgone are calculated for both the hydropower project purpose and for recreation. A full description of the methodology for NED hydropower impacts is contained in Appendix D to this WSSA and the recreation benefit analysis in contained in Appendix M of the EIS. Hydropower benefits forgone are summarized in Table 13 in average annual dollars based on the October 2016 (FY 2017) price levels, FY 2017 discount rate of 2.875 percent and a period of analysis of 50 years. Recreation benefits forgone are summarized in Table 13 in average annual dollars based on the September 2016 (FY 2016) price levels, FY 2017 discount rate of 2.875 percent and a period of analysis of 50 years. It should be noted that impacts to project purposes discussed in Section 6 of the EIS are a comparison of the No Action Alternative to the Proposed Action Alternative. The WSSA displays the comparison between the Without Project Condition (Alt7-J) and the Proposed Action Alternative.

Table 13. Benefits Forgone

Alternative	Total Benefits (Federal System)	Benefits Foregone compared to baseline (Without Project Future Condition)
With Out Project Condition Alt 7J	$225,558,000	$0
Hydropower	$90,482,000	$0
Recreation	$135,076,000	$0
Reallocation of 254,170 acre-feet (222 mgd)	$222,877,000	-$2,681,000
Hydropower	$88,488,000	-$1,994,000
Recreation	$134,389,000	-$687,000

Note: Hydropower benefits are in Average Annual Dollars at October 2016 (FY 2017) price levels. Price levels are updated via October 2016 EIA Short-term Energy Outlook. Recreation benefits are updated based on the FY 2017 Unit Day Value Economic Guidance Memorandum, which are September 2016 (FY 2016) price level.

5.2.2 Revenues Forgone

Revenues forgone are calculated for the ACF Federal system in accordance with guidance in the ER 1105-2-100. There are no revenues foregone for flood risk management, navigation, or recreation project purposes. A detailed discussion of the hydropower revenues forgone calculations and methodology is found in Appendix D of the WSSA. Revenues forgone are based on the capacity and energy rates as reported by Southeastern Power Administration, October 2016 (FY 2017) price levels, and average annual generation over a period of analysis of 50 years. Revenues forgone are $642,182 for the 222 mgd reallocation alternative (Alt 7K in the EIS).

Table 14. Hydropower Revenues Forgone

Alternatives	Estimated Revenue	Revenue Foregone
With Out Project Condition Alt 7J	$42,712,000	$0
Reallocation of 254,170 ac-ft (222 mgd)	$42,069,000	(642,000)

Note: Revenues and revenues foregone are displayed in average annual dollars.

5.2.3 Replacement Cost

No replacement cost was calculated for flood risk management as the volume of storage considered for reallocation would come from the conservation pool. The replacement cost of power is equivalent to the hydropower benefits forgone. Replacement Cost of Power, therefore, is $1,993,749 for the 222 mgd reallocation alternative.

5.2.4 Updated Cost of Storage

The cost allocated to the user under this pricing method updates the joint–use portion of the first costs of reservoir construction to present day price levels and then assigns a percentage of the costs based on the "Use of Facilities" (UOF) cost allocation procedure. Costs are updated from "as built" costs in 1953 (the mid-point of construction) to 1967 prices by use of the Engineering News Record (ENR) Construction Cost Index, and then from 1967 to current prices by use of the USACE's

Civil Works Construction Cost Index System (CWCCIS). Land values are updated by the weighted average update of all other project features. Costs are indexed from the midpoint of the physical construction period to the beginning of the FY in which the contract for the reallocated storage is expected to be approved (FY2017). Joint-use costs shown in Table 16 exclude infrastructure costs allocated to specific project purposes such as recreation facilities, hydropower turbines, etc.

Construction is considered as having been initiated at the start of the month when lands for the project were first acquired or on the date when the first construction contract was awarded whichever was earlier. Construction is considered as having been completed at the end of the government FY in which final deliberate impoundment of the reservoir pool was initiated.

The USACE policy on pricing storage reallocated from one authorized project purpose to another is based on the "UOF" methodology. Use of Facilities methodology allocates joint-use costs (costs that cannot be specifically allocated to a specific project purpose) based on overall percentage of storage reallocated. For example, if 15 percent of the usable storage is reallocated, then the reallocated storage is apportioned 15 percent of the joint-use costs. The cost of reallocated storage changes each government FY. This is due to the fact that the Federal discount rate changes on an annual basis as well as varying annual OMRR&R costs. Section 932 of the 1986 WRDA requires recalculation of the interest rate at 5-year intervals if the storage is paid annually over a 30-year period.

5.2.5 Cost of Reallocated Storage

The updated cost of storage is the highest of the four comparable costs; therefore, the updated costs of storage will be used to determine the user cost. Table 15 displays the results of the four pricing methods for comparison.

Table 15. Costs of Reallocated Storage

	Benefits Foregone compared to baseline (Without Project Future Condition)	Revenue Foregone	Replacement Cost	Updated Cost of Storage
With Out Project Condition Alt 7J	$0	$0	$0	$0
Reallocation of 254,170 acre-feet (222 mgd)	-$2,681,000	-$642,000	-$ 1,994,000	$2,769,000

Note: Costs are displayed in October 2016 (FY 2017) average annual dollars

The percent of usable storage is calculated in Table 16. The storage cost calculations for the 254,170 ac-ft is shown in Tables 17. The cost calculations are based on the updated cost of storage of $399,355,000 and a 5-year average OMRR&R costs of $471,000. The updated cost of storage over a 50-year period of analysis is $2,769,000.

Table 16. Update Joint-Use Costs

Category	Actual Joint use as of Mid-point of construction 1953	1953 ENR Index Ratio	1967 ENR Index	ENR ratio	1967 CWCCIS Index Base 100	Updated Joint-Use as of 1967	Sep 2017 CWCCIS Index	Update Factor	FY 2017 Joint Costs
Lands and Damages	10,184,000	600	1070	1.78	100	18,161,000	821.10	8.21[1]	149,120,000
Relocations	10,200,000	600	1070	1.78	100	18,190,000	821.67	8.22	149,462,000
Reservoir	2,191,000	600	1070	1.78	100	3,907,000	889.48	8.89	34,752,000
Dam	3,857,000	600	1070	1.78	100	6,878,000	781	7.81	53,713,000
Access Roads	436,000	600	1070	1.78	100	778,000	821.65	8.22	6,392,000
Buildings, Grounds, and utilities	276,000	600	1070	1.78	100	492,000	817.07	8.17	4,020,000
Permanent operating equipment	130,000	600	1070	1.78	100	232,000	817.07	8.17	1,896,000
Total	27,273,000		1070						399,355,000
Specific Costs Water Supply Conduit	Intakes already present								

1. Update factor for Lands and Damages acct was based on a weighted average of update factors for all other accounts.

Source: USACE (U.S. Army Corps of Engineers). 1960. Cost Allocation Studies: Apalachicola, Chattahoochee, and Flint River Project. U.S. Army Corps of Engineers, Mobile, AL.

Table 17. Lake Storage

Feature	Elevation (feet, NGCD)		Usable Storage (acre-feet)	Percent of	
				Usable Storage	Conservation Storage
Flood Control	1071	1085	602,200	35.91	
Conservation	1035	1071	1,074,600	64.09	100.00
Water Supply			254,170[1]	15.16	23.65
State of Georgia			254,170[1]	15.16	23.65
Other Conservation Purposes [list as appropriate]					
Total Usable Storage			1,676,800	100.00	

[1]The unit conversion factor used to convert mgd to cfs (cubic feet per second) is 1.547. This conversion factor is an input to the calculation of storage.

Table 18. Cost of Storage

Total Usable Storage for Lake Lanier (S_{Tot})		1,676,800 ac-ft
Storage Recommendation (S_{Rec})		254,170 ac-ft
Percent of Total Usable Storage P = S_{Req}/ S_{Tot} = 254,170 / 1,676,800		15.16%
Total Updated Cost of Storage for Lake Lanier (C_{Tot})		$399,355,000
Cost of Storage Recommendation (C_{Rec}) C_{Rec}= P x C_{Tot}		$ 60,534,000
Annual Cost of Storage Recommendation (A_{Rec})		Over 50 years*
$A_{Rec} = C_{Rec} \frac{i(1+i)^{n-1}}{(1+i)^n - 1}$	Where: C_{Rec} = $ i= 2.875% discount rate ,N = 50 year	$2,297,164
Operation and Maintenance for Lake Lanier($O\&M_{Tot}$)		$ 3,110,000
Lake Lanier Annual Operation and Maintenance Estimate ($O\&M_{Rec}$) $O\&M_{Rec}$ = P x $O\&M_{Tot}$		$ 471,444
Lake Lanier Annual Replacement, Repair and Rehabilitation Estimate ($R,R\&R_{Rec}$) $R,R,\&R_{Rec}$ = P x $R,R,\&R_{Tot}$		
Total Annual Cost =A_{Rec} + $O\&M_{Rec}$ + $R,R\&R_{rec}$ (Average Annual $)		$2,768,608

Notes:
1 Five-year (FY2011-FY2015) Average of Operations and Maintenance cost are based on a September 2016 (FY 2016) price level.
2. There has been no R,R,&R costs in the last 5 years.

5.3 Credit to the Power Marketing Agency

Per ER 1105-2-100, when hydropower is adversely impacted by reallocation of the conservation pool to satisfy additional water supply needs, hydropower losses can be mitigated through the provision of financial credit. In this case, credits would be provided to the hydropower account from a portion of the water supply storage proceeds. This credit is based on revenues foregone to the United States Treasury for repayment of the hydropower costs allocated to the project. Revenues foregone reflect the allocated costs to power upon which the rates are based. When reallocation is accomplished through this credit approach, in essence, the allocation of costs is adjusted without performing a laborious new cost allocation. Additionally, where existing Federal power delivery contracts require market purchases of power as a result of storage reallocations and withdrawals, the power marketing agency may obtain an additional credit for the funds expended for those purchases upon demonstration that they were made as a direct result of the reallocation.

Hydropower credits will not be given for losses that occur at non-federal facilities. Withdrawals from Lake Lanier covered under the original relocation contracts and releases for downstream withdrawals under the 1946 RHA will not result in credits to Southeastern Power Administration (SEPA), because both of these actions were originally authorized and are not a reallocation. Credits are calculated based on hydropower losses that resulted from reallocation of 254,170 ac-ft of storage. These credits will not be given directly to SEPA, but will apply for Department of Energy payback to the U.S. Treasury.

Power Marketing Agency credits are displayed in Table 38 in Appendix D in the Hydropower Analysis Report.

6.0 TEST OF FINANCIAL FEASIBILITY

To test the financial feasibility of the reallocation, the annual cost of the reallocated storage is compared to the annual cost of the most likely, least costly, alternative water supply source that would provide an equivalent quality and quantity of water if storage reallocation at Lake Lanier were not an option for the water supply customers. The following sections present the evaluation of two potential alternatives sources for the State of Georgia and the identification of the most likely, least costly water supply source if storage reallocation at Lake Lanier were not an option.

6.1 Least Costly Water Supply Alternatives to Meet Future Regional Demands

The forecasts for regional water demands for current and future Lake Lanier users and an inventory of existing and potential sources of water supply have been shown in

previous sections of the report. These demands and existing and potential sources of water supply were comprehensively discussed in the 2009 Water Supply and Water Conservation Management Plan and the 2009 Georgia Water Task Force Report. The State of Georgia has identified Lake Lanier water as its main source of water supply to meet forecast needs through 2050 because of existing withdrawal and distribution infrastructure, including pipelines and water treatment facilities. Maximum stated waste water treatment capacity through 2050 is expected to be 156.94 mgd. This is achieved through expanding existing facilities and constructing new facilities. Current and proposed water treatment facilities will provide enough capacity for the 2050 needs at Lake Lanier. The State of Georgia has identified Lake Lanier as the preferred source to meet a portion of future needs.

The State of Georgia will require water from Lake Lanier currently and beyond the immediate need. The State of Georgia is also planning for additional water supply sources in the future to accommodate additional needs of its users. Other sources are not expected to be realized in the near term because of the large financial resources required (hundreds of millions of dollars) and the need to consider social and environmental impacts. Two such alternatives being considered that could be implemented in the absence of reallocation are described below.

- A Chattahoochee River withdrawal and pumping system alterative would consist of constructing a pump and pipeline system downstream of Buford Dam and pumping the water upriver to existing treatment plants for distribution. Georgia proposed costs for this alternative are $1.4 billion.
- New reservoir development including potential construction both east and west of Lake Lanier. Proposed cost by the State of Georgia was approximately $1.8 billion.

Total and annual costs (including operation and maintenance costs) for both alternatives are displayed below in Table 19. These costs were provided by the State of Georgia in a letter to USACE on May 30, 2014 (Appendix B to this assessment) which stated that these costs were likely very conservative due to the unknown costs of potential environmental impacts, site specific costs, etc. The level of detail for these proposed costs was considered acceptable given the nature of their use in this analysis. A validation of these costs was provided by the USACE cost engineering team. This validation is included as Appendix C to this assessment.

Table 19. Costs of Two Possible Least Costly Alternatives Least Costly Alternatives

Alternative Supply Total Cost (Sep 2016 (FY 2016))	Average Annual Cost/ Total Cost (Sep 2016 (FY 2016))	Water Supply Yield (mgd)	Cost Per mgd (Sep 2016 (FY 2016))
Chattahoochee River Withdrawal and Pumping System	$54,315,000 $1,431,297,000	222	$6.48 Mil
New Reservoir(s)	$68,227,000 $1,797,901,000	222	$8.10 Mil

6.2 Most Likely Water Supply Alternative to Meet Future Regional Demands

The proposed Chattahoochee River Withdrawal and Pumping System would likely be implemented by multiple entities within the State. The system would serve users on both sides of Lake Lanier. The total capital cost of the proposed withdrawal and pumping system in September 2016 (FY 2016) dollars is estimated to be $1.4 billion. The total water supply yield of the withdrawal and pumping system is 222 mgd.

The total cost and the quantities of water required for new sources of water supply by year 2050 indicate that the withdrawal and pumping system would be the most likely and least costly choice for a new source of water supply.

The proposed system would be the most likely and least costly water supply alternative to (the existing source) Lake Lanier storage reallocation. The proposed withdrawal and pumping system is estimated to supply about 222 mgd for the State of Georgia (Lake Lanier users) and would have an estimated average annual cost of about $54,315,000. The Lake Lanier storage reallocation for the State of Georgia, with an average annual cost of $2,769,000 and an estimated yield of about 222 mgd, passes the test of financial feasibility without further analysis. The benefit-to-cost ratio is approximately 19.6:1. (The economic value of “$2,769,000” represents the FY 2017 updated cost of storage annualized over a 50-year period at a discount rate of 2.875 percent and does not represent the annual water storage agreement payments amortized over 30 years.)

7.0 RECOMMENDATION

The independent sector level water demand analysis completed by USACE validated that need by the State of Georgia in consideration for their request for storage from Lake Lanier.

A reallocation of water supply storage from conservation storage does not occur until water storage agreements are signed by all parties and the water supply user starts to pay for the storage. Therefore, the actual reallocation is often incremental and is implemented upon execution of water storage agreements. The storage authorized for reallocation, but not under agreement, is considered by the USACE to be conservation storage and is considered to be available to all authorized project purposes. The ASA(CW) has the authority to approve this reallocation of storage and the associated water supply agreements.

An EIS was prepared that presents the environmental effects of updating the water control manual for the ACF together with consideration of an expanded range of water supply alternatives associated with the Buford Dam/Lake Lanier Project, including current levels of water supply withdrawals and additional amounts that Georgia in 2015 requested from Lake Lanier and downstream at Atlanta. Impacts are discussed by project purpose and by resource area in Section 6 of the EIS.

For the reallocation of 254,170 ac-ft of storage, benefits forgone would consist of reduced energy and capacity that the SEPA could market as well as recreation impacts. The average annual impact measured as benefits forgone (both hydropower and recreation), evaluated over a 50-year economic evaluation period and a discount rate of 2.875 percent, would be $2,681,000.

Average annual water supply benefits for the reallocation of 254,170 ac-ft of storage (about 222 mgd), evaluated over a 50-year economic evaluation period and a discount rate of 2.875 percent, would be $54,315,000 (including O&M). This value is based on the least costly, most likely alternative costs that would be implemented in the absence of reallocation from Lake Lanier.

To test the financial feasibility of Lake Lanier storage reallocation, the annual cost of the proposed reallocated storage was compared to the annual cost of the most likely, least costly, water supply source that would provide an equivalent quality and quantity of water if storage reallocation at Lake Lanier was not an option for the State of Georgia. The proposed Chattahoochee River Withdrawal and Pumping scenario was found to be the most likely and least costly water supply alternative to Lake Lanier storage reallocation. The proposed withdrawal and pumping scenario can supply about 222 mgd for the State of Georgia and would have an estimated average annual cost of about $54,315,000. The Lake Lanier storage reallocation, with an average annual cost of $2,769,000, passes the test of financial feasibility by a factor of more than 19.6:1.

Based on the foregoing, it is recommended to reallocate 254,170 ac-ft of conservation storage to water supply. This alternative is the most cost effective and timely response to satisfy a portion of the projected water demands in the State of Georgia for current and potential Lake Lanier users. The annual first cost to the user is $2,892,000 as

shown in Table 20. An estimate of the user's share of annual O&M cost is $471,000. The annual payment will also include the user's share of repair, rehabilitation, and replacement (R, R, and R) cost. There have been no replacement, repair, rehabilitation (R, R, R), costs to date and the estimated annual payment of $3,364,000 is displayed in Table 20. In 2015, Buford Dam's Dam Safety Action Classification (DSAC) was changed from a DSAC 4 to a DSAC 3. This was a result of potential issues identified in the Periodic Assessment. As a result of this change in classification potential Interim Risk Reduction Measures (IRRMs) will likely be implemented in the future. Water supply users will be responsible to share costs related to the IRRMs equal to the percentage of usable storage (15.16%) covered under the water supply agreement.

Table 20. Total Annual Cost to User for the Reallocated Water Supply Storage

Total Usable Storage for Lake Lanier (S_{Tot})		1,676,800 ac-ft
Storage Recommendation (S_{Rec})		254,170 ac-ft
Percent of Total Conservation Storage $P = S_{Rec} / S_{Tot}$		15.16%
Total Updated Cost of Storage for Lake Lanier (C_{Tot})		$399,355,000
Cost of Storage Recommendation (C_{Rec}) $C_{Rec} = P \times C_{Tot}$		$60,534,387
Annual Cost of Storage Recommendation (A_{Rec})		
$A_{Rec} = C_{Rec} \dfrac{i(1+i)^{n-1}}{(1+i)^{n}-1}$	Where: C_{Rec} = $ i= 2.375% discount rate +.125% N = 30 year[3]	$2,892,190
Operation and Maintenance for Lake Lanier($O\&M_{Tot}$)		$3,110,192
Lake Lanier Annual Operation and Maintenance Estimate ($O\&M_{Rec}$) $O\&M_{Rec} = P \times O\&M_{Tot}$		$471,444
Lake Lanier Annual Replacement, Repair and Rehabilitation Estimate ($R,R\&R_{Rec}$) $R,R,\&R_{Rec} = P \times R,R,\&R_{Tot}$		$ -
Total Annual Cost =A_{Rec} + $O\&M_{Rec}$ + $R,R\&R_{rec}$ (Average Annual $)		$3,363,634

Notes:

1 Five-year (FY2011-FY2015) Average of Operations and Maintenance cost are evaluated at September 2016 (FY 2016) price level.

2. There has been no R,R,&R costs in the last 5 years

3. Section 932 of the 1986 WRDA requires recalculation of the interest rate at 5-year intervals if the storage is paid annually over a 30-year period.

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Water Use for Georgia Agricultural (Farm Use) Withdrawal Permitted –Golf Courses; Cliff Lewis, Georgia EPD, Tifton, Georgia.

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Appendix A: Georgia 2015 Water Supply Request

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Georgia Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr. Drive, Suite 1456, Atlanta, Georgia 30334
Judson H. Turner, Director
(404) 656-4713

December 4, 2015

Via U.S. Mail and Electronic Mail
Colonel Jon J. Chytka
District Commander
Mobile District, U. S. Army Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628

RE: State of Georgia's Water Supply Request

Dear Col. Chytka:

As you are aware, on January 11, 2013, Governor Nathan Deal of the State of Georgia updated the State's Apalachicola-Chattahoochee-Flint ("ACF") Water Supply Request in a letter to the Honorable Jo-Ellen Darcy, Assistant Secretary of the Army for Civil Works. In that letter, Governor Deal requested that the U.S. Army Corps of Engineers meet projected water supply demands of 705 million gallons per day ("mgd"), with 297 mgd being withdrawn directly from Lake Lanier and 408 mgd being withdrawn from the Chattahoochee River below Buford Dam. This request was based on projected demands through approximately 2040 using the best information and data available to the State of Georgia at the time the request was made.

As you know, the Metropolitan North Georgia Water Plan District ("Metro District") revised its water demand projections for the Atlanta metro area in August 2015. Because the revised demand projections now constitute the best available information about future water supply needs in the area served by Lake Lanier, the State has decided to modify its water supply request to reflect this new information. Accordingly, the State of Georgia wishes to modify its January 11, 2013 water supply request as follows: to provide for withdrawals directly from Lake Lanier in the amount of 242 mgd (instead of 297 mgd) and to provide for releases from Buford Dam to accommodate withdrawals from the Chattahoochee River above the confluence with Peachtree Creek in the range of 355 to 379 mgd (instead of 408 mgd). The variability in river demands is driven largely by uncertainty regarding the supply available to the Cobb County-Marietta Water Authority from Allatoona Lake in the Alabama-Coosa-Tallapoosa Basin.

Additional details are provided in the two memoranda attached to this letter. The first is a memorandum from the Metro District outlining the District's water supply needs through the year 2050. The second addresses water supply needs for four counties located above Lake Lanier but outside of the Metro District.

The State of Georgia will present additional information as part of its comments on the Draft Environmental Impact Statement ("Draft EIS") for the Corps' ACF water control manual, which will be submitted to the Corps during the public comment period. If you require additional information prior to receiving Georgia's comments on the Draft EIS, please let me know.

Sincerely,

Judson H. Turner
Director

Enc.

Metropolitan North Georgia Water Planning District
40 Courtland Street NE | Atlanta, Georgia 30303

MEMORANDUM

Date: **December 2, 2015**

To: **Jud Turner, Director, Georgia Environmental Protection Division**

From: **Katherine Zitsch, Director**

RE: **Projected Future Water Supply Demands for the Chattahoochee River and Lake Lanier System**

The Metropolitan North Georgia Water Planning District (the Metro Water District) is currently updating its Water Supply and Water Conservation Management, Wastewater Management, and Watershed Management Plans for the 15-county metropolitan Atlanta area. The updated plans will supersede the prior versions of the plans, issued in 2009, that served as a basis for the Governor's 2013 updated water supply request to the U.S. Army Corps of Engineers. These updated plans are scheduled to be completed and approved by the Metro Water District's Board in November 2016.

The Metro Water District has prepared water demand projections for the current planning period extending to the year 2050.[1] These projections address water needs for residential, commercial, industrial and institutional uses that are supplied by municipal systems across the Metro Water District. The Metro Water District projections do not include thermoelectric uses.

As you requested, we are providing a summary of the projections for those jurisdictions that withdraw water from the Chattahoochee River and Lake Lanier system. The projections below incorporate the most recent information concerning regional population trends and future population and employment growth rates, the effects of existing and projected future water conservation measures, and economic activity. As such, they represent the best and most reliable

[1] The Metro Water District is also preparing corresponding projections of future wastewater returns. Because future water demand in each county is a key input to models developed to project future wastewater flows into each wastewater system, reliable projections of future wastewater returns cannot be developed until water demand projections have been developed. Thus, the Metro Water District uses a phased planning approach in which water demand projections are developed before projections of future wastewater returns. Additional information regarding future wastewater returns will be provided as that information becomes available.

projection of the range of future water supply demands for the Metro Water District, including the Chattahoochee River and Lake Lanier system.

1. WATER SUPPLY DEMANDS

The Metro Water District has contracted with CH2M Hill, Inc. (CH2M) to generate county-level water demand projections through 2050 for each of the 15 counties in the Metro Water District's planning area. The core methods used to project water demand in the Metro Water District are the same as in prior plan revisions. These methods are described in the Metro Water District's 2009 plan.[2] This memorandum will therefore provide only a summary of the methods used, with a focus on certain refinements developed in the current process to improve the quality of the Metro Water District's demand projections.

1.1. County-Level Projected Demands Through 2050

In general, county-level water demand projections are a function of two variables: (1) future population and employment and (2) future water use by residents and employees. This latter category includes specific projections of future per capita water use; future per employee water use; the impacts of water conservation measures, including codes and standards and the requirements of the Georgia Water Stewardship Act; and an adjustment to total demand to account for potential uncertainty in future projections. These variables are discussed in greater detail below.

1.1.1. Forecasted Future Population and Employment

The Metro Water District used two sets of population and employment forecasts to project future water demand: (1) population and employment forecasts prepared by the Atlanta Regional Commission's Research and Analytics Division (ARC Forecasts) and (2) population forecasts issued by the Office and Planning and Budget in 2015 and correlating employment forecasts prepared by ARC (OPB Forecasts).

ARC provided county-level population and employment forecasts that were calculated using a Regional Econometric Model (REMI model). County level forecasts were then presented to Metro Water District jurisdictions for their review, so that population forecasts could be adjusted to account for factors driving future growth that are not captured by the REMI model. The methodology used by ARC's Research and Analytics Division is set forth in the attached memorandum included as Attachment 1. The ARC Forecasts are included as Attachment 2 (population) and Attachment 3 (employment), respectively.

The OPB Forecasts were prepared by the University of Georgia's Carl Vinson Institute of Government. Because OPB and ARC use differing methodologies, OPB does not provide

[2] Metropolitan North Georgia Water Planning District, Water Supply and Water Conservation Management Plan (2009).

corresponding forecasts of future employment. Therefore, corresponding forecasts of future employment were developed by ARC's Research and Analytics Division and included in all water demand scenarios using the OPB Forecasts. The methods used by ARC's Research and Analytics Division to prepare correlating employment forecasts are described in Attachment 1. The OPB Forecasts are included as Attachment 4 (population) and Attachment 5 (employment), respectively.

The ARC Forecasts and OPB Forecasts are summarized below in Table 1 (population) and Table 2 (employment).

Table 1. Summary of ARC and OPB Population Forecasts

	ARC Population Forecasts				OPB Population Forecasts			
County	**2020**	**2030**	**2040**	**2050**	**2020**	**2030**	**2040**	**2050**
Bartow	130,924	160,133	178,780	189,569	108,763	118,274	125,461	131,085
Cherokee	270,994	336,152	394,907	437,370	265,020	331,015	406,740	494,713
Clayton	283,792	304,371	327,266	350,555	282,488	302,823	315,351	321,509
Cobb	726,369	799,383	893,279	969,932	781,311	863,236	930,414	984,089
Coweta	165,321	204,744	235,587	256,038	152,575	182,430	213,856	247,779
DeKalb	725,746	789,454	870,176	945,468	756,138	800,302	824,638	835,063
Douglas	148,812	175,224	201,144	220,545	155,959	185,446	215,834	247,930
Fayette	109,427	124,558	140,809	148,739	114,379	122,584	127,011	129,033
Forsyth	255,412	356,079	431,478	468,230	245,429	334,694	450,066	597,255
Fulton	1,050,286	1,143,594	1,235,645	1,310,110	1,104,788	1,278,928	1,453,507	1,631,265
Gwinnett	927,056	1,073,102	1,239,115	1,392,162	985,396	1,176,845	1,375,267	1,581,299
Hall	234,487	287,486	330,425	362,697	210,468	244,958	280,791	318,828
Henry	256,188	311,014	353,232	379,989	241,568	289,270	339,799	395,121
Paulding	169,951	213,806	259,524	297,884	170,901	209,745	253,980	304,621
Rockdale	96,909	113,320	129,993	145,344	95,285	106,944	116,872	126,086
TOTAL	**5,551,674**	**6,392,420**	**7,221,360**	**7,874,632**	**5,670,468**	**6,547,495**	**7,429,586**	**8,345,677**

Table 2. Summary of ARC and OPB Employment Forecasts

County	ARC Employment Forecasts				OPB Population-Based Employment Forecasts			
	2020	2030	2040	2050	2020	2030	2040	2050
Bartow	62,524	69,819	76,352	82,193	56,867	60,238	64,315	67,420
Cherokee	95,421	108,787	123,123	128,021	93,318	107,124	126,812	144,806
Clayton	187,706	201,227	216,228	231,625	186,843	200,204	208,356	212,433
Cobb	526,073	581,725	641,877	699,093	565,865	628,192	668,561	709,297
Coweta	64,037	71,972	79,668	86,453	59,100	64,128	72,319	83,664
DeKalb	524,712	573,647	625,031	679,851	546,685	581,529	592,322	600,463
Douglas	71,786	81,812	91,924	100,510	75,234	86,585	98,637	112,990
Fayette	84,908	93,954	102,838	111,192	88,750	92,465	92,761	96,461
Forsyth	85,801	100,872	115,834	134,805	82,447	94,814	120,824	171,952
Fulton	1,098,358	1,182,107	1,268,878	1,360,794	1,155,354	1,321,998	1,492,600	1,694,373
Gwinnett	488,390	549,702	611,597	671,565	519,125	602,845	678,798	762,803
Hall	118,756	133,564	147,120	160,535	106,591	113,806	125,021	141,118
Henry	96,029	107,685	118,775	127,670	90,549	100,156	114,258	132,754
Paulding	54,898	63,544	72,732	80,089	55,205	62,337	71,178	81,900
Rockdale	54,289	61,027	67,890	74,363	53,379	57,593	61,037	64,510
TOTAL	**3,613,688**	**3,981,444**	**4,359,867**	**4,728,759**	**3,735,312**	**4,174,014**	**4,587,799**	**5,076,944**

The ARC Forecasts and OPB Forecasts provide separate and independent forecasts of future population for each county in the Metro Water District. These independent forecasts were derived using different methodologies, thus improving the reliability of the Metro Water District's demand projections.

1.1.2. Baseline Water Use

CH2M calculated current and projected future water use for each county in the Metro Water District. CH2M collected demographic data from the US census, water withdrawal data from Georgia EPD, water audit information from Georgia EPD, and data from the Metro Water District regarding plumbing fixture stock. In addition, CH2M surveyed and collected customer billing data and water loss audit information from utilities in the Metro Water District. Responding utilities provided information regarding water use within their system, including water use by customer class (e.g., residential, multi-family residential, commercial, institutional),

water production, peak day demands, and water audit information. Customer class information was provided based on customer classes as defined in each individual utility's billing software.

Water use data were standardized and compiled on a county basis, reflecting the individual mix of water uses across each county (e.g., residential, multi-family residential, commercial, institutional, municipal, irrigation, other, and self-supplied). Base water demand was calculated for each county for the years 2010, 2011, 2012, and 2014, as available, to create a representative base year.[3] The base year water demand incorporates the effects of the Metro Water District's EPA award-winning conservation program and existing state codes and standards.

1.1.3. Baseline and Enhanced Efficiency Demand Scenarios

Base water demands for each county were then paired with corresponding county-level population and employment forecasts from the OPB Forecasts and ARC Forecasts, and analyzed using the Decision Support System (DSS) Water Demand and Conservation Model created by Maddaus Water Management Inc. This analysis yielded two "baseline" water demand scenarios for each county: "Scenario 1 Baseline" using the ARC Forecasts and "Scenario 2 Baseline" using the OPB Forecasts. Outputs from the DSS Model showing projected future water demand through 2050 for each of the "baseline" scenarios are included as Attachment 6 and Attachment 7, respectively.

Water conservation and efficiency measures adopted by the Metro Water District and the State of Georgia have dramatically decreased water demands within the Metro Water District. In fact, per capita water demand use has declined by over 30 percent since 2000. Similarly, total water withdrawals have decreased by over 10 percent, despite a 20-percent increase in total population. The accomplishments achieved to date are accounted for in the baseline scenarios described above.

The efficiency measures put in place are expected to continue to drive per capita water use lower into the future. Therefore, the DSS Model was then used to analyze the effects of existing State and Federal plumbing codes and laws, including the Georgia Water Stewardship Act, the National Energy Policy Act of 1992 and the US EPA Energy Star program. The analysis considered the replacement of toilets, urinals, showerheads, and clothes washing machines on a county-specific basis. This resulted in two additional sets of projections for each county in the Metro Water District: "Scenario 1 Enhanced Efficiency" and "Scenario 2 Enhanced Efficiency." Outputs from the DSS Model showing projected future water demand through 2050 for each of the "enhanced efficiency" scenarios are included as Attachment 8 and Attachment 9, respectively.

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[3] Year 2013 was atypically wet and water demands were unusually low. In order to create a representative baseline demand, 2013 demand was removed from the baseline demand calculations.

Projected water demands were presented to Metro Water District jurisdictions for review and comment. Projections for certain jurisdictions were revised to account for county-specific factors that could influence future demand beyond modeled projections.

1.1.4. Uncertainty

Water demand projections used for planning purposes must be reasonably conservative, as it takes many years to plan, develop, and construct the infrastructure necessary to meet future water needs. There is uncertainty, however, associated with any projection of future water demand because drivers of water use (e.g., population, employment, per capita use) vary over time.

In the Metro Water District's current planning process, the projected water use from the DSS Model provides a projection of future water demands by county for each of the scenarios analyzed. Actual future water use over the long-term (35-year) planning horizon could be lower or higher than this projection. This is due to the variability of key drivers of water demand, including population growth, employment growth, and water use rates. For example, two key water demand drivers include potential shifts in employment sectors and job growth across the region.

Because the Metro Water District needs to provide reasonably conservative projections of water demands, an "uncertainty factor" was used to adjust water demand projections to account for potential variability. This uncertainty factor was derived by analyzing historical variability in four water demand drivers:

1. Population growth rate
2. Employment/population ratio
3. Per capita residential water use
4. Per employee commercial water use

Probability distributions based on historical data were created for each demand driver and truncated to remove unrealistic extremes. CH2M then used a Monte Carlo analysis (50,000 simulations) to determine future water demand probabilities based on the observed historical variability in demand drivers. The results of this Monte Carlo analysis were used to estimate the range of probabilities around the median "enhanced efficiency" projections described above.

The 65th percentile demand projection was used to calculate the uncertainty factor that was applied to each individual county. The 65th percentile was chosen based on the Metro Water District's professional judgment that it reflected the appropriate balance between the need for realistic planning projections and conservatism required for long-term infrastructure development. For each county, this resulted in an increase in water demands of approximately 3 percent for the 2016 projections, increasing to approximately 13 percent for the 2050 projections. These enhanced efficiency water demand projections incorporating the uncertainty factor are shown below in Table 3, and are included as Attachment 10 and Attachment 11, respectively.

Table 3. Adjusted 2050 Water Demands in the Metro Water District

County	ARC (Scenario 1) Water Demand Projection (AAD-MGD)			OPB (Scenario 2) Water Demand Projection (AAD-MGD)		
	2015	2025	2050	2015	2025	2050
Bartow	27.5	36.4	52.0	27.5	31.4	40.4
Cherokee	19.9	25.0	35.2	19.9	24.4	39.5
Clayton	25.0	28.9	37.6	25.0	29.1	33.6
Cobb	71.3	77.1	98.1	71.3	80.6	96.0
Coweta	13.7	17.4	23.7	13.7	16.0	23.5
DeKalb	73.0	77.5	95.4	73.0	78.7	83.2
Douglas	12.8	14.9	20.0	12.8	15.2	21.7
Fayette	11.8	12.9	16.7	11.8	12.8	14.0
Forsyth	22.7	31.5	47.9	22.7	29.5	59.6
Fulton	142.7	155.3	186.4	142.7	166.4	227.4
Gwinnett	84.4	96.2	132.1	84.4	101.2	145.2
Hall	20.2	25.0	33.9	20.2	22.7	31.0
Henry	23.7	29.6	39.4	23.7	28.1	41.5
Paulding	12.8	15.6	23.0	12.8	15.5	24.0
Rockdale	13.2	15.4	21.1	13.2	14.8	18.3
District Total	**574.5**	**658.6**	**862.5**	**574.5**	**666.5**	**899.0**

1.2. Isolating Demands for the Chattahoochee-Lanier System

Water demands described above were projected for each county in the Metro Water District without regard to water supply source. However, only a portion of the water demand in the Metro Water District is supplied through withdrawals from Lake Lanier or the Chattahoochee River below Buford Dam. At your request, the Metro Water District has isolated these demands to provide a projection of 2050 water demands from the Chattahoochee-Lanier system. Note that the water demand projections below utilize the highest forecasted population for each county to provide a conservative projection of future demand.

1.2.1. Lake Lanier Demands

Three counties (and their included cities and water systems) in the Metro Water District withdraw water directly from Lake Lanier: Hall County, Forsyth County, and Gwinnett County. With the exception of certain self-supplied sources and very limited municipal groundwater production within these counties,[4] direct withdrawals from Lake Lanier supply the water demands within these jurisdictions.

Projected water supply demands for jurisdictions that withdraw water from Lake Lanier are shown in Table 4. To be conservative, these demands reflect the higher of each county-level demand derived from the two enhanced efficiency scenarios, as adjusted by the uncertainty factor.

Table 4
Water Supply Projections – Lake Lanier

County	2050 Projected Demand (AADF – mgd)
Forsyth County[5]	59
Gwinnett County[6]	143
Hall County[7]	32
Total Lake Demand	**234**

The Governor's 2013 updated water supply request projected 41 mgd for counties located upstream of Lake Lanier (Dawson, Habersham, Lumpkin, and White) that currently withdraw water from the Chattahoochee River above the reservoir. These counties are outside of the Metro Water District's planning area and are not addressed in the current projections.

1.2.2. Chattahoochee River Demands – Above Peachtree Creek

Total projected water supply demands for jurisdictions withdrawing water from the Chattahoochee River and its tributaries above Peachtree Creek range from 355 mgd to 379 mgd. Projections for each jurisdiction are set forth in Table 5. Again, to be conservative, reported river

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[4] Across all three counties, self-supply and municipal withdrawals from groundwater sources are projected to supply only 4.99 million gallons per day (mgd) of future demand. This includes water supplied by currently permitted municipal groundwater wells (1.2 mgd in Hall County and 2.0 mgd in Gwinnett County), water supplied by groundwater wells currently in the permitting process (0.53 mgd in Forsyth County) and amounts projected to be self-supplied by groundwater wells (0.37 mgd in Forsyth County and 0.89 mgd in Hall County). Projected future demands for these counties have been reduced by the amount projected to be supplied from these other sources.

[5] Includes Forsyth County and the City of Cumming.

[6] Includes Gwinnett County and the City of Buford.

[7] Includes Hall County and the City of Gainesville.

demands reflect the higher of each county-level demand derived from the two enhanced efficiency scenarios, as adjusted by the uncertainty factor.

Table 5
Water Supply Projections
Chattahoochee River Upstream of Peachtree Creek

County	2050 Projected Demand (AADF – mgd)
Cobb County[8]	37 to 61
DeKalb County	95
Fulton County	223
Total Chattahoochee River Demand	**355 to 379**

The variability in projected river demands is driven largely by uncertainty regarding the supply available to the Cobb County-Marietta Water Authority (CCMWA) from Allatoona Lake in the Alabama-Coosa-Tallapoosa (ACT) Basin, which is contested by the State of Alabama and others and is the subject of ongoing litigation against the U.S. Army Corps of Engineers. All Cobb County projections assume demands not met through withdrawals from Allatoona Lake will be met through withdrawals from the Chattahoochee River. The lower Cobb County projection (2050 = 37 mgd) assumes CCMWA withdrawals from Allatoona Lake in accordance with the permit issued by Georgia EPD on November 7, 2014. Demands in excess of this range are possible depending on the resolution of the issues in dispute.

Fulton County jurisdictions withdraw water from the Chattahoochee River and its tributaries both above and below the confluence with Peachtree Creek. The Fulton County projection provided above includes withdrawals upstream of Peachtree Creek for the Atlanta-Fulton Water Resources Commission, the City of Atlanta, the City of Roswell's Big Creek facility (from a tributary to the Chattahoochee River), and 6 mgd supplied by the City of Atlanta to Coweta County. The projected Fulton County demands for the Chattahoochee River upstream of Peachtree Creek do not include the City of Roswell's groundwater supply or water sold by East Point and Palmetto using water supply sources downstream of Peachtree Creek.

As with the Lake Lanier demands above, jurisdictions withdrawing water from the Chattahoochee River have extremely limited groundwater resources, and the amounts of self-supplied water and municipal groundwater withdrawals are accordingly very low. Total demands for each county shown above have been reduced to account for these alternative sources of supply.[9]

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[8] Includes 4 mgd supplied to Douglas County and 1 mgd supplied to Cherokee County.

[9] For Fulton County, projected future demands for the Chattahoochee River upstream of Peachtree Creek have been reduced to account for currently permitted groundwater wells (0.17 mgd), amounts supplied by East Point (8.7 mgd) and Palmetto (0.4 mgd) and amounts projected to be self-supplied by groundwater wells (0.45 mgd). No other counties withdrawing water from the Chattahoochee River above Peachtree Creek utilize groundwater or self-supplied sources.

Attachment 1

ATLANTA REGIONAL COMMISSION

40 Courtland Street, NE
Atlanta, Georgia 30303
atlantaregional.com

MEMORANDUM

TO: Neela Ram, Metropolitan North Georgia Water Planning District

FROM: Jim Skinner, Atlanta Regional Commission

DATE: August 24, 2015 (Revised November 2015)

RE: Population and Employment Projections for the Metro Water District

One of the primary responsibilities of the Atlanta Regional Commission's (ARC) Research and Analytics Division (RAD) is the production of socioeconomic forecasts for a defined horizon year at the regional and small-area level. These are produced in direct support of transportation and land use planning efforts across the 20-county ARC air quality nonattainment area. This forecasting process occurs at the frequency of scheduled conformity plan updates—every three to five years.

Development of the most current draft regional forecast began in January of 2015, with 2040 as the defined horizon year. This regional forecast, which was the first element of series 15.0 in support of "The Atlanta Region's Plan," was developed and calibrated for the 20-county ARC air quality nonattainment area using the baseline of a standard forecast from the Regional Econometric Models Inc. (REMI) econometric model. This baseline standard forecast, which used Build 3.6.5R of the REMI model, was released in October 2014 and included 21 specific regions consisting of each of the 20 counties in ARC's Metropolitan Planning Organization, plus the rest of the state of Georgia as a single region. Forecasts were produced for over 6,000 economic and demographic variables.

The baseline standard regional forecasts for Series 15.0 were reviewed and calibrated by the RAD staff and a Technical Advisory Committee (TAC) that was comprised of over twenty public and private sector economists and public policy experts. Based on TAC analysis and discussion in early 2015, a draft regional forecast with a horizon year of 2040 was released in March 2015. This forecast also included sub regional (county) totals for employment and population that were not explicitly reviewed by the TAC. Concurrent to TAC review, RAD staff also met with Metropolitan Planning Organization member jurisdictions beginning in February 2015 to receive input on refinement of the subarea forecasts of population and employment for Series 15.0.

In May 2015, the Metropolitan North Georgia Water Planning District (Metro Water District) requested draft Series 15.0 forecasts for population and employment with a defined horizon year of 2050. RAD's Series 15.0 population and employment projections for the 20-county Metropolitan Planning Organization include the 15 counties within the Metro Water District. To address the Metro Water District request, RAD staff created custom calibration within the REMI econometric model that would allow for the horizon extension from 2040 to 2050. This work was finalized in late June 2015.

In addition to ARC employment and population forecasts to 2050, the Metro Water District requested RAD staff to develop employment projections based on the University of Georgia's Carl Vinson Institute population projections for the Georgia Office of Planning and Budget (OPB). The OPB

population projections, which were developed with a horizon year of 2050, used a traditional population cohort-component model. Because the OPB series did not include employment forecasts, RAD developed a related employment series using a simple share allocation methodology. A ratio of population to employment for each year by county was calculated from the baseline standard REMI forecasts for each county. The derived ratios were then applied to the OPB series population numbers to create annual forecasts for employment for each county through 2050.

RAD transmitted the following to the Metro Water District in mid-July 2015:

- Draft extended Series 15.0 ARC population and employment forecasts
- Draft OPB series of derived employment forecasts.

RAD specified that both forecast series were produced explicitly for use by the Metro Water District for the purposes of water demand forecasting as part of the 2016 Water Resources Management Plan Update.

Attachment 2

ARC Forecast - Population

	Bartow	Cherokee	Clayton	Cobb	Coweta	DeKalb	Douglas	Fayette	Forsyth	Fulton	Gwinnett	Hall	Henry	Paulding	Rockdale
2013	102285	222889	270381	714127	132258	716004	134201	107629	190305	992270	853571	187928	209909	146331	87117
2014	106799	229171	270627	709785	137040	712201	135551	106760	198539	998277	860034	195058	216671	148258	88028
2015	111251	235817	271866	708468	141888	711121	137302	106465	207227	1005191	868436	202134	223496	150933	89214
2016	115602	242872	273867	709982	146798	712394	139386	106605	216506	1014082	878974	209153	230417	154212	90620
2017	119768	250015	276200	712940	151631	714828	141643	107033	225969	1023336	890410	215940	237199	157851	92138
2018	123706	257116	278689	716834	156335	717975	143977	107669	235633	1032537	902313	222401	243752	161728	93709
2019	127418	264137	281250	721392	160905	721656	146378	108488	245466	1041556	914573	228579	250092	165800	95305
2020	130924	270994	283792	726369	165321	725746	148812	109427	255412	1050286	927056	234487	256188	169951	96909
2021	134251	277702	286263	731609	169604	730175	151263	110477	265392	1058745	939714	240166	262077	174140	98508
2022	137425	284241	288599	737054	173776	734967	153740	111640	275348	1066977	952545	245641	267798	178362	100090
2023	140500	290693	290680	742966	177836	740192	156247	112904	285365	1075441	965810	251020	273390	182579	101662
2024	143491	297104	292590	749464	181799	745879	158780	114261	295449	1084290	979571	256304	278885	186824	103242
2025	146406	303509	294442	756536	185696	752070	161373	115715	305546	1093524	993885	261532	284327	191113	104840
2026	149254	309918	296259	764080	189537	758681	164004	117262	315663	1102986	1008641	266722	289706	195453	106460
2027	152054	316386	298120	772127	193363	765716	166707	118920	325782	1112696	1023879	271919	295054	199888	108117
2028	154798	322909	300059	780729	197162	773212	169481	120692	335889	1122780	1039723	277096	300375	204410	109811
2029	157495	329495	302144	789860	200964	781151	172322	122601	346009	1133130	1056180	282298	305706	209050	111547
2030	160133	336152	304371	799383	204744	789454	175224	124558	356079	1143594	1073102	287486	311014	213806	113320
2031	162603	342617	306532	808770	208379	797529	178042	126484	365639	1153552	1089812	292469	316079	218488	115055
2032	164915	348937	308729	818121	211884	805506	180806	128364	374710	1163110	1106397	297256	320906	223152	116767
2033	167077	355107	310948	827531	215263	813484	183511	130187	383279	1172566	1123020	301879	325559	227762	118453
2034	169091	361146	313200	836976	218511	821496	186166	131947	391366	1181882	1139627	306352	330009	232350	120126
2035	170972	367072	315495	846484	221633	829578	188782	133624	398976	1191108	1156267	310675	334292	236938	121795
2036	172739	372890	317809	855983	224648	837665	191359	135221	406163	1200215	1172907	314868	338401	241519	123450
2037	174393	378590	320148	865452	227548	845776	193889	136747	412979	1209228	1189516	318925	342348	246077	125100
2038	175949	384163	322503	874832	230334	853895	196365	138184	419466	1218135	1206115	322866	346131	250605	126737
2039	177401	389595	324872	884100	233012	861989	198779	139536	425648	1226901	1222604	326693	349755	255087	128368
2040	178780	394907	327266	893279	235587	870176	201144	140809	431478	1235645	1239115	330425	353232	259524	129993
2041	180085	400052	329674	902256	238066	878304	203440	141992	436949	1244198	1255473	334062	356567	263883	131604
2042	181311	405007	332061	911000	240419	886353	205662	143067	442026	1252557	1271635	337559	359738	268138	133196
2043	182466	409755	334441	919436	242662	894271	207799	144039	446703	1260625	1287536	340946	362732	272292	134763
2044	183566	414291	336783	927565	244805	902059	209852	144924	450980	1268449	1303188	344251	365574	276330	136313
2045	184624	418624	339136	935393	246858	909744	211832	145719	454827	1276048	1318654	347467	368274	280248	137852
2046	185643	422758	341448	942927	248818	917268	213728	146433	458270	1283378	1333807	350612	370826	284046	139370
2047	186642	426694	343750	950144	250710	924617	215551	147084	461326	1290471	1348725	353692	373266	287711	140868
2048	187617	430433	346023	957026	252535	931775	217286	147672	463996	1297286	1363437	356717	375587	291232	142347
2049	188593	433991	348293	963623	254314	938721	218950	148220	466305	1303842	1377904	359721	377829	294623	143846
2050	189569	437370	350555	969932	256038	945468	220545	148739	468230	1310110	1392162	362697	379989	297884	145344

Attachment 3

ARC Forecast - Employment

	Bartow	Cherokee	Clayton	Cobb	Coweta	DeKalb	Douglas	Fayette	Forsyth	Fulton	Gwinnett	Hall	Henry	Paulding	Rockdale
2013	53430	77555	166782	456714	53592	465777	59375	72590	69856	986346	412801	101660	80952	43430	45496
2014	54926	80285	169055	464522	55171	473125	61060	74144	72218	1002870	422524	104213	83378	44926	46638
2015	56864	83762	173190	477733	57204	484432	63438	76678	75256	1022677	436267	107614	86237	47198	48386
2016	58579	87067	177645	492090	59150	496653	65734	79027	78182	1047529	450896	110901	89017	49296	50085
2017	59909	89794	181178	503608	60721	506352	67676	80983	80609	1066312	463147	113518	91302	51048	51487
2018	60869	91922	183652	512129	61938	513151	69183	82428	82454	1078858	472490	115424	93021	52474	52541
2019	61737	93826	185856	519635	63060	519229	70572	83784	84220	1089559	481007	117193	94635	53800	53479
2020	62524	95421	187706	526073	64037	524712	71786	84908	85801	1098358	488390	118756	96029	54898	54289
2021	63305	96940	189491	532060	64985	530133	72936	86010	87344	1106935	495368	120335	97391	55909	55051
2022	64015	98248	191026	537112	65858	535151	73981	87007	88900	1114445	501497	121745	98630	56868	55695
2023	64767	99475	192213	542371	66627	540013	74975	87884	90364	1122881	507483	123305	99725	57692	56346
2024	65483	100696	193347	547773	67339	544697	75896	88679	91801	1131658	513377	124755	100769	58464	56989
2025	66188	101961	194571	553375	68072	549496	76851	89472	93264	1140486	519464	126210	101866	59268	57632
2026	66892	103225	195744	558681	68803	554097	77769	90289	94700	1148409	525281	127650	102944	60057	58255
2027	67630	104589	197012	564205	69579	558865	78749	91148	96208	1156582	531192	129160	104058	60898	58914
2028	68380	105984	198395	570189	70358	563941	79770	92063	97746	1165857	537497	130642	105240	61750	59618
2029	69102	107349	199794	576048	71163	568863	80781	93019	99328	1174343	543723	132107	106475	62621	60320
2030	69819	108787	201227	581725	71972	573647	81812	93954	100872	1182107	549702	133564	107685	63544	61027
2031	70519	110197	202646	587578	72785	578531	82816	94878	102431	1190297	555853	134989	108858	64443	61723
2032	71232	111642	204132	593348	73606	583291	83849	95789	103966	1197947	561859	136389	109994	65374	62405
2033	71918	113044	205686	599351	74415	588382	84850	96665	105458	1206650	568049	137758	111174	66254	63083
2034	72579	114479	207183	605326	75194	593509	85874	97546	106953	1215303	574106	139132	112277	67160	63758
2035	73217	115934	208713	611492	75957	598816	86912	98434	108446	1224183	580260	140484	113417	68120	64458
2036	73874	117398	210239	617632	76737	604120	87966	99315	109937	1233087	586470	141832	114535	69087	65143
2037	74500	118844	211721	623758	77492	609357	88984	100206	111418	1241965	592681	143157	115632	70022	65839
2038	75126	120277	213182	629786	78221	614515	89977	101066	112890	1250791	598971	144462	116689	70944	66516
2039	75704	121667	214634	635632	78929	619445	90926	101918	114339	1259239	605054	145757	117710	71826	67189
2040	76352	123123	216228	641877	79668	625031	91924	102838	115834	1268878	611597	147120	118775	72732	67890
2041	76963	123471	217788	647819	80403	630388	92871	103737	117448	1277982	617928	148504	119814	73585	68569
2042	77557	124080	219263	653786	81090	635776	93798	104589	119017	1287166	624187	149790	120815	74406	69243
2043	78163	124813	220824	659685	81798	641232	94721	105456	120612	1296257	630387	151141	121773	75240	69913
2044	78778	125562	222374	665563	82513	646776	95624	106334	122214	1305462	636581	152510	122738	76048	70600
2045	79379	126238	223982	671352	83199	652311	96521	107155	123863	1314642	642690	153858	123628	76811	71274
2046	79951	126862	225499	677111	83855	657888	97372	107985	125581	1323884	648594	155169	124468	77552	71909
2047	80533	127370	227069	682784	84522	663468	98216	108809	127464	1333165	654492	156510	125308	78248	72529
2048	81070	127727	228583	688271	85167	668988	98989	109595	129527	1342228	660284	157820	126092	78883	73116
2049	81627	127958	230094	693725	85817	674457	99758	110385	131947	1351507	665922	159179	126877	79498	73734
2050	82193	128021	231625	699093	86453	679851	100510	111192	134805	1360794	671565	160535	127670	80089	74363

Attachment 4

OPB Forecast - Population

	Bartow	Cherokee	Clayton	Cobb	Coweta	DeKalb	Douglas	Fayette	Forsyth	Fulton	Gwinnett	Hall	Henry	Paulding	Rockdale
2013	101273	225106	264220	717190	133180	713340	136379	108365	195405	984293	859304	187745	211128	146950	86919
2014	102356	230658	266935	726508	135910	719755	139148	109209	202214	1001447	877116	190949	215391	150302	88109
2015	103438	236210	269649	735825	138639	726171	141917	110054	209023	1018601	894928	194153	219654	153654	89299
2016	104521	241762	272364	745143	141369	732586	144686	110898	215831	1035754	912741	197356	223916	157007	90489
2017	105603	247314	275078	754460	144098	739002	147455	111743	222640	1052908	930553	200560	228179	160359	91679
2018	106686	252866	277793	763778	146828	745417	150224	112587	229449	1070062	948365	203764	232442	163711	92869
2019	107725	258943	280140	772545	149702	750778	153091	113483	237439	1087425	966881	207116	237005	167306	94077
2020	108763	265020	282488	781311	152575	756138	155959	114379	245429	1104788	985396	210468	241568	170901	95285
2021	109802	271098	284835	790078	155449	761499	158826	115274	253419	1122150	1003912	213819	246130	174496	96494
2022	110840	277175	287183	798844	158322	766859	161694	116170	261409	1139513	1022427	217171	250693	178091	97702
2023	111879	283252	289530	807611	161196	772220	164561	117066	269399	1156876	1040943	220523	255256	181686	98910
2024	112831	289943	291543	815773	164211	776529	167535	117914	278320	1174318	1060245	224000	260081	185617	100087
2025	113783	296634	293556	823935	167226	780837	170510	118762	287240	1191759	1079546	227478	264906	189548	101263
2026	114682	303510	295409	831795	170267	784730	173497	119527	296731	1209193	1099006	230974	269779	193587	102399
2027	115580	310386	297263	839655	173308	788623	176484	120291	306222	1226627	1118466	234470	274652	197627	103536
2028	116478	317262	299116	847515	176348	792516	179472	121055	315712	1244060	1137926	237966	279524	201666	104672
2029	117376	324138	300970	855376	179389	796409	182459	121820	325203	1261494	1157386	241462	284397	205706	105808
2030	118274	331015	302823	863236	182430	800302	185446	122584	334694	1278928	1176845	244958	289270	209745	106944
2031	119047	338348	304273	870339	185534	803180	188464	123132	345564	1296360	1196604	248508	294253	214043	107979
2032	119819	345682	305722	877442	188638	806057	191482	123679	356434	1313793	1216362	252057	299237	218341	109013
2033	120591	353016	307172	884545	191743	808935	194499	124226	367304	1331226	1236121	255606	304220	222638	110047
2034	121363	360350	308621	891648	194847	811813	197517	124773	378174	1348658	1255879	259155	309203	226936	111081
2035	122135	367684	310071	898751	197952	814691	200535	125321	389044	1366091	1275637	262704	314187	231234	112116
2036	122800	375495	311127	905084	201133	816680	203595	125659	401248	1383574	1295563	266322	319309	235783	113067
2037	123466	383306	312183	911416	204314	818670	206654	125997	413452	1401057	1315489	269939	324431	240332	114018
2038	124131	391117	313239	917749	207494	820659	209714	126335	425657	1418541	1335415	273556	329554	244881	114969
2039	124796	398928	314295	924081	210675	822648	212774	126673	437861	1436024	1355341	277174	334676	249431	115921
2040	125461	406740	315351	930414	213856	824638	215834	127011	450066	1453507	1375267	280791	339799	253980	116872
2041	126043	415136	316081	936024	217156	825930	218975	127218	463792	1471115	1395504	284510	345158	258837	117788
2042	126625	423533	316810	941634	220456	827222	222116	127426	477518	1488723	1415740	288229	350517	263694	118705
2043	127207	431929	317540	947244	223756	828513	225257	127633	491245	1506331	1435977	291948	355876	268551	119621
2044	127789	440326	318270	952854	227055	829805	228398	127840	504971	1523939	1456213	295667	361234	273409	120537
2045	128371	448723	319000	958464	230355	831097	231539	128048	518697	1541547	1476450	299386	366593	278266	121454
2046	128914	457921	319502	963589	233840	831891	234817	128245	534409	1559491	1497419	303274	372299	283537	122380
2047	129457	467119	320003	968714	237325	832684	238095	128442	550120	1577434	1518389	307163	378005	288808	123307
2048	130000	476317	320505	973839	240810	833477	241373	128639	565832	1595378	1539359	311051	383710	294079	124233
2049	130542	485515	321007	978964	244295	834270	244652	128836	581544	1613321	1560329	314939	389416	299350	125160
2050	131085	494713	321509	984089	247779	835063	247930	129033	597255	1631265	1581299	318828	395121	304621	126086

Attachment 5

OPB Forecast - Employment

	Bartow	Cherokee	Clayton	Cobb	Coweta	DeKalb	Douglas	Fayette	Forsyth	Fulton	Gwinnett	Hall	Henry	Paulding	Rockdale
2013	52538	78326	162982	458673	53966	464044	60339	73086	71728	978417	415574	101561	81422	43614	45393
2014	53154	80806	166748	475466	54716	478143	62680	75845	73555	1006054	430916	102018	82885	45545	46681
2015	54281	83902	171778	496180	55894	494684	65570	79263	75908	1036320	449576	103365	84754	48049	48432
2016	55223	86669	176670	516460	56962	510730	68233	82210	77938	1069916	468218	104646	86506	50189	50013
2017	55862	88824	180442	532937	57705	523475	70453	84546	79422	1097126	484027	105433	87830	51859	51231
2018	56224	90403	183062	545667	58171	532764	72185	86193	80290	1118066	496605	105752	88705	53117	52070
2019	56551	91981	185123	556481	58669	540182	73809	87641	81466	1137542	508517	106189	89683	54289	52790
2020	56867	93318	186843	565865	59100	546685	75234	88750	82447	1155354	519125	106591	90549	55205	53379
2021	57226	94635	188546	574581	59561	552875	76583	89745	83404	1173226	529210	107134	91465	56023	53925
2022	57556	95806	190088	582140	60001	558373	77808	90538	84400	1190208	538289	107635	92330	56782	54366
2023	57942	96929	191453	589562	60393	563379	78964	91124	85308	1207908	546961	108324	93110	57410	54821
2024	58265	98269	192655	596237	60824	567080	80081	91514	86479	1225619	555657	109031	93975	58086	55247
2025	58589	99651	193985	602674	61301	570515	81202	91828	87676	1242940	564236	109776	94908	58783	55666
2026	58891	101091	195182	608193	61808	573122	82271	92033	89020	1258990	572341	110541	95863	59484	56033
2027	59228	102606	196445	613549	62362	575584	83368	92199	90432	1275006	580264	111372	96863	60209	56418
2028	59580	104131	197772	618965	62931	578020	84472	92340	91874	1291790	588264	112194	97935	60921	56828
2029	59912	105604	199017	623829	63523	579974	85533	92426	93355	1307376	595824	112997	99053	61619	57217
2030	60238	107124	200204	628192	64128	581529	86585	92465	94814	1321998	602845	113806	100156	62337	57593
2031	60687	108824	201152	632308	64805	582630	87664	92363	96807	1337654	610322	114699	101341	63132	57927
2032	61148	110601	202144	636371	65531	583690	88800	92293	98895	1353143	617702	115650	102567	63964	58261
2033	61590	112378	203188	640644	66284	585092	89931	92239	101062	1369922	625258	116642	103887	64764	58606
2034	62017	114227	204154	644867	67051	586513	91110	92243	103348	1386795	632670	117697	105198	65595	58958
2035	62433	116127	205125	649249	67841	588070	92323	92317	105746	1404025	640165	118792	106596	66480	59335
2036	62820	118218	205818	653060	68704	588986	93591	92292	108607	1421468	647800	119964	108073	67446	59664
2037	63188	120324	206453	656886	69579	589828	94843	92328	111546	1438988	655448	121168	109580	68387	60007
2038	63563	122454	207058	660681	70465	590596	96094	92400	114556	1456569	663183	122399	111100	69324	60340
2039	63909	124582	207646	664377	71363	591174	97328	92523	117620	1473874	670744	123664	112635	70233	60674
2040	64315	126812	208356	668561	72319	592322	98637	92761	120824	1492600	678798	125021	114258	71178	61037
2041	64665	128127	208808	672064	73341	592797	99963	92944	124663	1511061	686849	126476	115980	72178	61371
2042	65004	129756	209193	675770	74357	593361	101302	93154	128573	1529858	694922	127900	117718	73173	61709
2043	65356	131567	209665	679637	75425	594081	102679	93445	132638	1548908	703065	129420	119471	74206	62057
2044	65712	133453	210150	683709	76530	594970	104075	93799	136845	1568407	711331	130986	121281	75244	62429
2045	66057	135314	210683	687910	77637	595919	105501	94160	141257	1588171	719597	132568	123064	76268	62795
2046	66355	137414	211005	691948	78807	596653	106980	94572	146446	1608711	728154	134219	124962	77413	63143
2047	66655	139437	211383	696128	80009	597500	108488	95018	151998	1629622	736824	135921	126899	78546	63487
2048	66907	141343	211726	700362	81213	598413	109963	95470	157955	1650647	745479	137616	128819	79654	63812
2049	67166	143149	212068	704769	82436	599411	111468	95949	164555	1672300	754085	139363	130768	80773	64156
2050	67420	144806	212433	709297	83664	600463	112990	96461	171952	1694373	762803	141118	132754	81900	64510

Attachment 6

PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multi Family	Commercial	Industrial	Irrigation	Agricultural	Self Supplied	New Commercial	Anheuser-Busch	NRW	Total	AADD (MGD)
2015	2,003	222	392	2,103	23	17	207	4	1,826	2,991	9,787	**27**
2016	2,093	231	404	2,166	23	17	206	175	1,826	3,108	10,249	**28**
2017	2,179	239	413	2,215	24	17	205	311	1,826	3,245	10,674	**29**
2018	2,261	247	420	2,251	24	17	204	409	1,826	3,369	11,028	**30**
2019	2,338	255	426	2,283	25	17	203	498	1,826	3,471	11,340	**31**
2020	2,410	262	431	2,312	25	17	202	579	1,826	3,561	11,624	**32**
2021	2,480	268	437	2,341	25	17	201	658	1,826	3,642	11,895	**33**
2022	2,546	275	441	2,367	26	17	200	731	1,826	3,721	12,149	**33**
2023	2,610	281	447	2,395	26	17	199	808	1,826	3,795	12,402	**34**
2024	2,672	287	452	2,421	26	17	198	881	1,826	3,871	12,650	**35**
2025	2,732	293	456	2,447	26	17	197	953	1,826	3,944	12,892	**35**
2026	2,792	298	461	2,473	27	17	196	1,025	1,826	4,016	13,131	**36**
2027	2,850	304	466	2,501	27	17	195	1,101	1,826	4,088	13,374	**37**
2028	2,907	309	472	2,528	27	17	194	1,177	1,826	4,161	13,618	**37**
2029	2,964	315	476	2,555	28	17	193	1,251	1,826	4,234	13,858	**38**
2030	3,019	320	481	2,582	28	17	192	1,324	1,826	4,306	14,094	**39**
2031	3,070	325	486	2,608	28	17	191	1,396	1,826	4,373	14,320	**39**
2032	3,118	330	491	2,634	28	17	190	1,469	1,826	4,438	14,541	**40**
2033	3,164	334	496	2,659	29	17	189	1,539	1,826	4,502	14,754	**40**
2034	3,206	338	500	2,684	29	17	188	1,607	1,826	4,563	14,957	**41**
2035	3,246	342	505	2,707	29	17	187	1,672	1,826	4,621	15,152	**42**
2036	3,283	345	509	2,732	30	17	186	1,739	1,826	4,678	15,344	**42**
2037	3,318	349	514	2,755	30	17	185	1,803	1,826	4,734	15,529	**43**
2038	3,351	352	518	2,778	30	17	184	1,867	1,826	4,788	15,710	**43**
2039	3,381	355	522	2,799	30	17	183	1,926	1,826	4,840	15,880	**44**
2040	3,411	357	526	2,823	31	17	182	1,992	1,826	4,890	16,056	**44**
2041	3,438	360	531	2,846	31	17	182	2,055	1,826	4,942	16,227	**44**
2042	3,465	362	535	2,868	31	17	181	2,115	1,826	4,992	16,392	**45**
2043	3,489	365	539	2,890	31	17	180	2,177	1,826	5,041	16,555	**45**
2044	3,513	367	543	2,913	31	17	179	2,240	1,826	5,089	16,719	**46**
2045	3,536	369	547	2,935	32	17	178	2,302	1,826	5,138	16,880	**46**
2046	3,558	371	551	2,956	32	17	177	2,360	1,826	5,186	17,035	**47**
2047	3,579	373	555	2,978	32	17	176	2,420	1,826	5,233	17,189	**47**
2048	3,600	375	559	2,998	32	17	175	2,475	1,826	5,280	17,337	**47**
2049	3,621	377	563	3,018	33	17	174	2,532	1,826	5,325	17,486	**48**
2050	3,642	379	567	3,039	33	17	174	2,589	1,826	5,371	17,636	**48**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)												
	Single Family	Multifamily	Commercial	Institutional	Industrial	Irrigation	Agricultural	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	3,950	563	245	50	223	250	99	152	365	1	1,184	7,081	**19**
2016	4,083	580	255	51	232	260	99	156	363	1	1,219	7,299	**20**
2017	4,217	597	263	53	239	268	99	161	361	1	1,256	7,515	**21**
2018	4,351	614	269	54	245	275	99	165	359	1	1,292	7,724	**21**
2019	4,483	630	275	56	250	280	99	170	358	1	1,326	7,928	**22**
2020	4,613	647	279	57	254	285	99	174	356	1	1,360	8,125	**22**
2021	4,739	663	284	59	258	290	99	179	354	1	1,392	8,316	**23**
2022	4,862	678	288	60	262	294	99	183	352	1	1,423	8,501	**23**
2023	4,984	694	291	61	265	297	99	187	351	1	1,453	8,683	**24**
2024	5,105	709	295	63	268	301	99	191	349	1	1,483	8,863	**24**
2025	5,226	724	298	64	271	305	99	195	347	1	1,513	9,044	**25**
2026	5,346	740	302	65	275	308	99	199	345	1	1,544	9,225	**25**
2027	5,468	755	306	67	278	313	99	203	344	1	1,574	9,408	**26**
2028	5,591	771	310	68	282	317	99	208	342	1	1,605	9,593	**26**
2029	5,715	786	314	69	286	321	99	212	340	1	1,636	9,780	**27**
2030	5,841	802	318	71	290	325	99	216	338	1	1,668	9,969	**27**
2031	5,963	818	323	72	293	329	99	220	337	1	1,698	10,153	**28**
2032	6,082	833	327	74	297	334	99	224	335	1	1,728	10,333	**28**
2033	6,198	848	331	75	301	338	99	228	333	1	1,758	10,509	**29**
2034	6,312	862	335	76	305	342	99	232	332	1	1,786	10,682	**29**
2035	6,424	876	339	77	309	346	99	236	330	1	1,815	10,852	**30**
2036	6,533	890	344	79	313	351	99	240	328	1	1,843	11,020	**30**
2037	6,641	904	348	80	316	355	99	243	327	1	1,870	11,184	**31**
2038	6,746	917	352	81	320	359	99	247	325	1	1,897	11,345	**31**
2039	6,849	930	356	82	324	364	99	250	323	1	1,923	11,501	**32**
2040	6,949	943	360	83	328	368	99	254	322	1	1,949	11,655	**32**
2041	7,046	955	361	84	329	369	99	257	320	1	1,973	11,796	**32**
2042	7,140	967	363	85	330	371	99	260	319	1	1,996	11,931	**33**
2043	7,230	978	365	86	332	373	99	263	317	1	2,018	12,063	**33**
2044	7,316	989	368	87	334	375	99	266	315	1	2,039	12,189	**33**
2045	7,398	999	369	88	336	377	99	269	314	1	2,059	12,310	**34**
2046	7,477	1,009	371	89	338	379	99	272	312	1	2,078	12,425	**34**
2047	7,551	1,018	373	90	339	381	99	274	311	1	2,096	12,533	**34**
2048	7,622	1,027	374	91	340	382	99	277	309	1	2,113	12,635	**35**
2049	7,690	1,036	375	91	341	382	99	279	308	1	2,129	12,731	**35**
2050	7,755	1,044	375	92	341	383	99	281	306	1	2,144	12,821	**35**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Agricultura	Other	Comm	NRW	Total	AADD (MGD)
2015	3,948	1,821	999	413	836	0	19	1	869	8,907	24
2016	3,977	1,834	999	424	843	0	20	150	875	9,121	25
2017	4,011	1,850	999	432	850	0	20	269	897	9,328	26
2018	4,047	1,867	999	438	857	0	21	352	918	9,498	26
2019	4,084	1,884	999	443	865	0	21	426	935	9,657	26
2020	4,121	1,901	999	448	873	0	21	488	951	9,801	27
2021	4,157	1,917	999	452	881	0	21	548	964	9,939	27
2022	4,191	1,933	999	456	888	0	21	600	978	10,065	28
2023	4,221	1,947	999	458	894	0	21	639	989	10,170	28
2024	4,249	1,960	999	461	900	0	22	678	999	10,267	28
2025	4,275	1,972	999	464	906	0	22	719	1,008	10,365	28
2026	4,302	1,984	999	467	911	0	22	758	1,017	10,461	29
2027	4,329	1,997	999	470	917	0	22	801	1,027	10,562	29
2028	4,357	2,010	999	473	923	0	22	847	1,037	10,669	29
2029	4,387	2,024	999	477	930	0	22	894	1,048	10,781	30
2030	4,420	2,039	999	480	936	0	22	942	1,059	10,898	30
2031	4,451	2,053	999	483	943	0	23	990	1,071	11,013	30
2032	4,483	2,068	999	487	950	0	23	1,040	1,082	11,132	30
2033	4,515	2,083	999	491	957	0	23	1,092	1,094	11,253	31
2034	4,548	2,098	999	494	964	0	23	1,143	1,106	11,374	31
2035	4,581	2,113	999	498	971	0	23	1,194	1,118	11,497	31
2036	4,615	2,129	999	501	978	0	23	1,245	1,130	11,620	32
2037	4,649	2,144	999	505	985	0	24	1,295	1,142	11,743	32
2038	4,683	2,160	999	508	992	0	24	1,344	1,154	11,865	33
2039	4,717	2,176	999	512	999	0	24	1,393	1,166	11,987	33
2040	4,752	2,192	999	516	1,007	0	24	1,447	1,178	12,115	33
2041	4,787	2,208	999	519	1,014	0	24	1,499	1,191	12,242	34
2042	4,822	2,224	999	523	1,022	0	25	1,549	1,203	12,366	34
2043	4,856	2,240	999	527	1,029	0	25	1,601	1,215	12,492	34
2044	4,890	2,256	999	530	1,036	0	25	1,653	1,227	12,617	35
2045	4,924	2,272	999	534	1,043	0	25	1,707	1,239	12,744	35
2046	4,958	2,287	999	538	1,050	0	25	1,758	1,252	12,868	35
2047	4,991	2,303	999	542	1,058	0	25	1,811	1,264	12,992	36
2048	5,024	2,318	999	545	1,065	0	26	1,862	1,276	13,114	36
2049	5,057	2,333	999	549	1,072	0	26	1,913	1,288	13,236	36
2050	5,090	2,348	999	552	1,078	0	26	1,964	1,300	13,358	37

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercia	NRW	Total	AADD (MGD)
2015	12,497	3,621	5,223	682	392	0	779	1	1	2,190	25,385	**70**
2016	12,524	3,628	5,380	684	403	0	803	1	1	2,195	25,618	**70**
2017	12,576	3,644	5,506	686	413	0	821	1	1	2,219	25,867	**71**
2018	12,645	3,663	5,599	690	420	0	835	1	1	2,244	26,097	**71**
2019	12,725	3,687	5,681	694	426	0	847	1	1	2,266	26,328	**72**
2020	12,813	3,712	5,751	699	431	0	858	1	1	2,287	26,553	**73**
2021	12,906	3,739	5,817	704	436	0	868	1	1	2,307	26,778	**73**
2022	13,002	3,767	5,872	710	440	0	876	1	1	2,327	26,995	**74**
2023	13,106	3,797	5,929	715	445	0	885	1	1	2,348	27,226	**75**
2024	13,221	3,830	5,988	722	449	0	893	1	1	2,369	27,474	**75**
2025	13,345	3,866	6,050	728	454	0	902	1	1	2,393	27,740	**76**
2026	13,478	3,905	6,108	736	458	0	911	1	1	2,417	28,014	**77**
2027	13,620	3,946	6,168	743	462	0	920	1	1	2,442	28,304	**78**
2028	13,772	3,990	6,234	752	467	0	930	1	1	2,469	28,615	**78**
2029	13,933	4,037	6,298	760	472	0	939	1	1	2,498	28,938	**79**
2030	14,101	4,085	6,360	770	477	0	949	1	1	2,527	29,269	**80**
2031	14,267	4,133	6,424	779	482	0	958	1	1	2,555	29,598	**81**
2032	14,432	4,181	6,487	788	486	0	968	1	1	2,583	29,926	**82**
2033	14,598	4,229	6,552	797	491	0	977	1	1	2,611	30,258	**83**
2034	14,764	4,277	6,618	806	496	0	987	1	1	2,640	30,590	**84**
2035	14,932	4,326	6,685	815	501	0	997	1	1	2,669	30,927	**85**
2036	15,100	4,375	6,752	824	506	0	1,007	1	1	2,698	31,264	**86**
2037	15,267	4,423	6,819	833	511	0	1,017	1	1	2,727	31,599	**87**
2038	15,432	4,471	6,885	842	516	0	1,027	1	1	2,756	31,931	**87**
2039	15,596	4,518	6,949	851	521	0	1,037	1	1	2,784	32,257	**88**
2040	15,757	4,565	7,017	860	526	0	1,047	1	1	2,812	32,586	**89**
2041	15,916	4,611	7,082	869	531	0	1,057	1	1	2,840	32,906	**90**
2042	16,070	4,656	7,147	877	536	0	1,066	1	1	2,866	33,220	**91**
2043	16,219	4,699	7,212	885	541	0	1,076	1	1	2,893	33,526	**92**
2044	16,362	4,740	7,276	893	545	0	1,085	1	1	2,918	33,822	**93**
2045	16,500	4,780	7,339	901	550	0	1,095	1	1	2,943	34,110	**93**
2046	16,633	4,819	7,402	908	555	0	1,104	1	1	2,966	34,390	**94**
2047	16,761	4,856	7,464	915	560	0	1,114	1	1	2,990	34,660	**95**
2048	16,882	4,891	7,524	921	564	0	1,122	1	1	3,012	34,919	**96**
2049	16,998	4,925	7,584	928	569	0	1,131	1	1	3,033	35,170	**96**
2050	17,110	4,957	7,643	934	573	0	1,140	1	1	3,054	35,412	**97**

PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	ew Commerc	Self-Supplied	NRW	Total	AADD (MGD)
2015	2,234	320	496	66	305	370	181	0	405	483	4,860	**13**
2016	2,332	331	512	69	315	383	188	0	401	500	5,031	**14**
2017	2,429	342	526	71	324	395	193	0	397	517	5,193	**14**
2018	2,523	352	537	73	330	408	196	0	393	532	5,345	**15**
2019	2,614	363	546	75	336	419	200	0	389	547	5,491	**15**
2020	2,703	373	555	77	341	431	203	0	385	561	5,630	**15**
2021	2,789	382	563	79	346	442	206	0	381	574	5,764	**16**
2022	2,873	392	571	81	351	453	209	0	377	587	5,895	**16**
2023	2,955	401	577	83	355	464	211	0	374	600	6,020	**16**
2024	3,035	410	583	85	359	474	214	0	370	612	6,142	**17**
2025	3,113	419	590	87	363	484	216	0	366	624	6,262	**17**
2026	3,191	427	596	89	367	494	218	0	363	636	6,380	**17**
2027	3,268	436	603	91	371	504	221	0	359	647	6,499	**18**
2028	3,344	445	610	92	375	514	223	0	355	659	6,617	**18**
2029	3,421	453	617	94	379	524	226	0	352	671	6,736	**18**
2030	3,497	462	624	96	384	534	228	0	348	682	6,854	**19**
2031	3,570	470	631	98	388	543	231	0	345	694	6,969	**19**
2032	3,641	478	638	99	392	552	233	0	341	705	7,080	**19**
2033	3,709	485	645	101	397	561	236	0	338	715	7,187	**20**
2034	3,775	493	651	102	401	570	239	0	335	725	7,291	**20**
2035	3,838	500	658	104	405	578	241	0	331	735	7,390	**20**
2036	3,900	506	665	105	409	586	243	0	328	745	7,487	**21**
2037	3,959	513	671	107	413	593	246	0	325	754	7,581	**21**
2038	4,015	519	678	108	417	600	248	0	321	763	7,670	**21**
2039	4,070	525	684	109	421	607	250	0	318	772	7,757	**21**
2040	4,123	531	690	110	425	614	253	0	315	780	7,841	**21**
2041	4,174	537	697	112	428	621	255	0	312	788	7,923	**22**
2042	4,222	542	703	113	432	627	257	0	309	796	8,000	**22**
2043	4,269	547	709	114	436	633	259	0	306	803	8,075	**22**
2044	4,313	552	715	115	440	638	262	0	303	810	8,147	**22**
2045	4,356	557	721	116	443	644	264	0	300	817	8,216	**23**
2046	4,396	561	727	117	447	649	266	0	297	823	8,282	**23**
2047	4,436	565	732	117	450	654	268	0	294	830	8,347	**23**
2048	4,474	569	738	118	454	658	270	0	291	836	8,409	**23**
2049	4,511	573	744	119	457	663	272	0	288	842	8,470	**23**
2050	4,547	577	749	120	461	667	274	0	285	848	8,529	**23**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	t/Condo (MF	Commercial	titutional (SC	unicipal (GO	Other	Irrigation	w Commerc	NRW	Total	AADD (MGD)
2015	10,756	3,847	4,889	227	137	26	645	1	5,441	25,969	**71**
2016	10,776	3,854	5,012	228	137	26	662	1	5,450	26,146	**72**
2017	10,813	3,867	5,110	229	137	27	675	1	5,496	26,354	**72**
2018	10,860	3,884	5,179	230	138	27	684	1	5,545	26,547	**73**
2019	10,916	3,904	5,240	231	139	27	692	1	5,590	26,739	**73**
2020	10,978	3,926	5,295	232	139	27	699	1	5,634	26,931	**74**
2021	11,045	3,950	5,350	233	140	27	706	1	5,677	27,129	**74**
2022	11,117	3,976	5,401	235	141	27	713	1	5,721	27,332	**75**
2023	11,196	4,004	5,450	237	142	28	719	1	5,767	27,543	**75**
2024	11,282	4,035	5,497	238	143	28	726	1	5,815	27,765	**76**
2025	11,376	4,069	5,545	240	145	28	732	1	5,865	28,001	**77**
2026	11,476	4,104	5,592	243	146	28	738	1	5,918	28,245	**77**
2027	11,582	4,142	5,640	245	147	28	744	1	5,972	28,503	**78**
2028	11,696	4,183	5,691	247	149	29	751	1	6,030	28,776	**79**
2029	11,816	4,226	5,741	250	150	29	758	1	6,091	29,060	**80**
2030	11,941	4,271	5,789	252	152	29	764	1	6,153	29,353	**80**
2031	12,064	4,315	5,838	255	153	30	771	1	6,212	29,638	**81**
2032	12,184	4,358	5,886	258	155	30	777	1	6,271	29,920	**82**
2033	12,305	4,401	5,938	260	156	30	784	1	6,330	30,205	**83**
2034	12,426	4,444	5,989	263	158	31	791	1	6,390	30,492	**84**
2035	12,548	4,488	6,043	265	159	31	798	1	6,451	30,784	**84**
2036	12,671	4,532	6,097	268	161	31	805	1	6,512	31,076	**85**
2037	12,793	4,576	6,149	270	163	31	812	1	6,574	31,369	**86**
2038	12,916	4,619	6,201	273	164	32	819	1	6,635	31,660	**87**
2039	13,039	4,663	6,251	276	166	32	825	1	6,696	31,948	**88**
2040	13,162	4,708	6,308	278	167	32	833	1	6,757	32,245	**88**
2041	13,285	4,752	6,362	281	169	33	840	1	6,819	32,540	**89**
2042	13,407	4,795	6,416	283	170	33	847	1	6,880	32,832	**90**
2043	13,527	4,838	6,471	286	172	33	854	1	6,940	33,122	**91**
2044	13,645	4,880	6,527	288	173	34	862	1	6,999	33,409	**92**
2045	13,761	4,922	6,583	291	175	34	869	1	7,059	33,693	**92**
2046	13,875	4,962	6,639	293	176	34	876	1	7,117	33,974	**93**
2047	13,986	5,002	6,695	296	178	34	884	1	7,175	34,250	**94**
2048	14,094	5,041	6,751	298	179	35	891	1	7,231	34,521	**95**
2049	14,199	5,078	6,806	300	180	35	898	1	7,286	34,785	**95**
2050	14,301	5,115	6,861	302	182	35	906	1	7,340	35,042	**96**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercial	NRW	Total	AADD (MGD)
2015	2,284	546	375	78	114	186	86	0	899	4,567	**13**
2016	2,319	554	388	79	118	189	89	0	913	4,649	**13**
2017	2,356	563	400	80	121	192	92	0	930	4,734	**13**
2018	2,395	573	409	82	124	195	94	0	947	4,818	**13**
2019	2,435	582	417	83	126	198	96	0	964	4,901	**13**
2020	2,476	592	424	84	129	201	97	0	981	4,984	**14**
2021	2,516	602	431	86	131	205	99	0	997	5,066	**14**
2022	2,558	612	437	87	132	208	100	0	1,013	5,148	**14**
2023	2,599	622	443	88	134	211	101	0	1,030	5,229	**14**
2024	2,641	632	448	90	136	215	103	0	1,046	5,311	**15**
2025	2,685	642	454	91	138	218	104	0	1,062	5,394	**15**
2026	2,728	652	459	93	139	222	105	0	1,079	5,479	**15**
2027	2,773	663	465	94	141	225	107	0	1,096	5,566	**15**
2028	2,819	674	471	96	143	229	108	0	1,114	5,655	**15**
2029	2,867	685	477	98	145	233	109	0	1,132	5,746	**16**
2030	2,915	697	483	99	147	237	111	0	1,150	5,839	**16**
2031	2,962	708	489	101	148	241	112	0	1,168	5,929	**16**
2032	3,008	719	495	102	150	245	113	0	1,185	6,018	**16**
2033	3,053	730	501	104	152	248	115	0	1,202	6,106	**17**
2034	3,097	741	507	105	154	252	116	0	1,219	6,192	**17**
2035	3,141	751	513	107	156	255	118	0	1,236	6,277	**17**
2036	3,183	761	520	108	158	259	119	0	1,252	6,361	**17**
2037	3,226	771	526	110	159	262	120	0	1,269	6,443	**18**
2038	3,267	781	532	111	161	266	122	0	1,284	6,524	**18**
2039	3,307	791	537	113	163	269	123	0	1,300	6,602	**18**
2040	3,346	800	543	114	165	272	124	0	1,315	6,680	**18**
2041	3,384	809	549	115	166	275	126	0	1,330	6,755	**19**
2042	3,421	818	554	116	168	278	127	0	1,344	6,827	**19**
2043	3,457	827	560	118	170	281	128	0	1,358	6,898	**19**
2044	3,491	835	565	119	171	284	129	0	1,371	6,965	**19**
2045	3,524	843	570	120	173	287	131	0	1,384	7,031	**19**
2046	3,556	850	575	121	174	289	132	0	1,396	7,094	**19**
2047	3,586	857	580	122	176	292	133	0	1,408	7,154	**20**
2048	3,615	864	585	123	177	294	134	0	1,420	7,212	**20**
2049	3,642	871	589	124	179	296	135	0	1,430	7,267	**20**
2050	3,669	877	594	125	180	298	136	0	1,441	7,320	**20**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AADD (MGD)
2015	2,416	157	444	56	29	82	195	478	333	4,189	11
2016	2,425	157	457	58	29	84	195	474	333	4,212	12
2017	2,443	157	469	59	29	86	196	469	336	4,244	12
2018	2,466	158	477	60	30	88	197	464	339	4,278	12
2019	2,494	159	485	61	30	89	198	459	342	4,318	12
2020	2,525	161	492	62	30	90	200	455	346	4,361	12
2021	2,559	162	498	63	30	92	202	450	350	4,406	12
2022	2,597	164	504	63	31	93	204	446	354	4,455	12
2023	2,637	166	509	64	31	94	206	441	358	4,506	12
2024	2,680	168	513	65	31	94	209	437	362	4,559	12
2025	2,725	170	518	65	32	95	212	433	367	4,616	13
2026	2,773	172	523	66	32	96	214	428	371	4,676	13
2027	2,824	175	528	66	33	97	217	424	377	4,741	13
2028	2,878	177	533	67	33	98	221	420	382	4,809	13
2029	2,936	180	538	68	34	99	224	416	388	4,883	13
2030	2,995	183	544	69	34	100	228	411	394	4,958	14
2031	3,053	186	549	69	35	101	231	407	400	5,032	14
2032	3,110	189	555	70	35	102	235	403	405	5,104	14
2033	3,165	191	560	71	36	103	238	399	411	5,174	14
2034	3,219	194	565	71	36	104	241	395	416	5,241	14
2035	3,270	196	570	72	37	105	244	391	421	5,306	15
2036	3,319	199	575	72	37	106	247	387	426	5,369	15
2037	3,365	201	580	73	38	107	250	383	431	5,428	15
2038	3,410	203	585	74	38	108	253	380	436	5,485	15
2039	3,452	205	590	74	38	109	255	376	440	5,539	15
2040	3,491	207	595	75	39	110	257	372	444	5,590	15
2041	3,528	209	601	76	39	110	260	368	448	5,638	15
2042	3,562	210	605	76	39	111	262	365	451	5,682	16
2043	3,594	212	610	77	40	112	263	361	454	5,723	16
2044	3,622	213	616	78	40	113	265	357	457	5,761	16
2045	3,648	214	620	78	40	114	266	354	460	5,795	16
2046	3,672	215	625	79	40	115	268	350	462	5,827	16
2047	3,694	216	630	79	40	116	269	347	465	5,857	16
2048	3,715	217	634	80	41	117	270	343	467	5,884	16
2049	3,734	218	639	81	41	118	271	340	469	5,909	16
2050	3,752	219	644	81	41	118	272	336	471	5,934	16

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	Commercial	Industrial	Municipal	Irrigation	Other	ew Commerc	Self Supplied	NRW	Total	AADD (MGD)
2015	4,313	910	456	61	253	36	1	194	1,839	8,063	22
2016	4,517	946	474	64	263	38	1	192	1,922	8,414	23
2017	4,724	975	488	67	271	40	1	190	2,003	8,759	24
2018	4,936	997	499	70	277	41	1	188	2,084	9,093	25
2019	5,152	1,019	510	72	283	43	1	186	2,161	9,427	26
2020	5,370	1,038	520	75	288	45	1	184	2,238	9,758	27
2021	5,589	1,056	529	78	293	47	1	182	2,313	10,089	28
2022	5,807	1,075	538	81	299	48	1	180	2,388	10,418	29
2023	6,027	1,093	547	84	303	50	1	179	2,463	10,747	29
2024	6,248	1,110	556	87	308	52	1	177	2,538	11,078	30
2025	6,469	1,128	565	90	313	54	1	175	2,613	11,408	31
2026	6,691	1,145	574	93	318	55	1	173	2,689	11,739	32
2027	6,913	1,164	583	96	323	57	1	172	2,764	12,072	33
2028	7,134	1,182	592	99	328	59	1	170	2,839	12,405	34
2029	7,356	1,201	602	102	334	61	1	168	2,915	12,739	35
2030	7,577	1,220	611	105	339	63	1	166	2,991	13,072	36
2031	7,786	1,239	620	108	344	64	1	165	3,062	13,389	37
2032	7,985	1,257	630	111	349	66	1	163	3,130	13,692	38
2033	8,173	1,275	639	113	354	67	1	161	3,195	13,979	38
2034	8,350	1,293	648	116	359	69	1	160	3,256	14,252	39
2035	8,517	1,312	657	118	364	70	1	158	3,314	14,511	40
2036	8,675	1,330	666	120	369	71	1	157	3,370	14,759	40
2037	8,825	1,347	675	122	374	73	1	155	3,423	14,995	41
2038	8,968	1,365	684	124	379	74	1	154	3,475	15,222	42
2039	9,104	1,383	693	126	384	75	1	152	3,524	15,440	42
2040	9,232	1,401	702	127	389	76	1	151	3,571	15,648	43
2041	9,352	1,420	711	129	394	77	1	149	3,615	15,849	43
2042	9,464	1,439	721	130	400	78	1	148	3,658	16,038	44
2043	9,567	1,459	730	132	405	78	1	146	3,697	16,216	44
2044	9,662	1,478	740	133	410	79	1	145	3,735	16,383	45
2045	9,747	1,498	750	134	416	80	1	143	3,769	16,538	45
2046	9,823	1,519	761	135	422	81	1	142	3,801	16,684	46
2047	9,891	1,542	772	136	428	81	1	140	3,831	16,822	46
2048	9,950	1,566	784	137	435	82	1	139	3,860	16,954	46
2049	10,002	1,596	799	138	443	82	1	137	3,887	17,085	47
2050	10,045	1,630	816	138	453	82	1	136	3,914	17,216	47

	PROJECTED BASEFLOW WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AADD (MGD)
2015	14,658	8,405	13,027	233	621	783	53	173	234	12,600	50,787	**139**
2016	14,792	8,479	13,344	236	636	790	55	174	231	12,711	51,448	**141**
2017	14,931	8,556	13,583	238	647	797	56	176	229	12,880	52,093	**143**
2018	15,070	8,633	13,743	240	655	804	56	178	227	13,040	52,645	**144**
2019	15,205	8,709	13,879	242	661	811	57	179	224	13,175	53,143	**146**
2020	15,337	8,782	13,991	244	667	818	57	181	222	13,295	53,593	**147**
2021	15,464	8,852	14,101	246	672	825	58	182	220	13,403	54,022	**148**
2022	15,588	8,921	14,196	248	676	831	58	183	218	13,507	54,427	**149**
2023	15,715	8,992	14,304	250	682	838	59	185	216	13,610	54,849	**150**
2024	15,848	9,066	14,416	252	687	844	59	186	213	13,720	55,292	**151**
2025	15,987	9,143	14,528	254	692	852	60	188	211	13,834	55,750	**153**
2026	16,129	9,222	14,629	256	697	859	60	190	209	13,951	56,202	**154**
2027	16,275	9,304	14,733	258	702	867	60	191	207	14,066	56,664	**155**
2028	16,426	9,388	14,851	261	708	874	61	193	205	14,185	57,153	**157**
2029	16,582	9,474	14,959	263	713	882	61	195	203	14,310	57,643	**158**
2030	16,738	9,562	15,058	266	718	891	62	197	201	14,433	58,124	**159**
2031	16,888	9,645	15,163	268	723	898	62	198	199	14,546	58,590	**161**
2032	17,031	9,725	15,260	270	727	906	63	200	197	14,656	59,035	**162**
2033	17,173	9,804	15,371	272	732	913	63	202	195	14,765	59,491	**163**
2034	17,313	9,882	15,481	275	738	920	63	203	193	14,877	59,945	**164**
2035	17,451	9,959	15,594	277	743	928	64	205	191	14,988	60,400	**165**
2036	17,588	10,035	15,708	279	748	935	64	206	189	15,099	60,852	**167**
2037	17,723	10,111	15,821	281	754	942	65	208	187	15,210	61,302	**168**
2038	17,857	10,185	15,933	283	759	949	65	209	185	15,321	61,747	**169**
2039	17,989	10,258	16,041	285	764	956	66	211	183	15,429	62,182	**170**
2040	18,120	10,332	16,164	287	770	962	66	212	182	15,537	62,632	**172**
2041	18,248	10,403	16,280	289	776	969	67	214	180	15,646	63,071	**173**
2042	18,374	10,473	16,397	291	781	975	67	215	178	15,753	63,504	**174**
2043	18,495	10,540	16,512	293	787	982	68	217	176	15,856	63,926	**175**
2044	18,612	10,606	16,630	295	792	988	68	218	175	15,958	64,341	**176**
2045	18,726	10,669	16,747	296	798	994	69	219	173	16,058	64,750	**177**
2046	18,837	10,731	16,864	298	804	999	69	221	171	16,156	65,150	**178**
2047	18,943	10,790	16,983	300	809	1,005	70	222	169	16,253	65,543	**180**
2048	19,046	10,847	17,098	301	815	1,010	70	223	168	16,347	65,925	**181**
2049	19,144	10,902	17,216	303	820	1,015	71	224	166	16,438	66,300	**182**
2050	19,239	10,954	17,334	304	826	1,020	71	225	164	16,528	66,666	**183**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercial	NRW	Total	AAD (MGD)
2015	15,093	4,070	3,196	414	191	273	757	1,218	1	4,837	30,050	**82**
2016	15,276	4,119	3,304	428	197	276	782	1,232	1	4,896	30,512	**84**
2017	15,475	4,173	3,393	439	203	280	804	1,248	1	4,976	30,992	**85**
2018	15,682	4,228	3,462	448	207	284	820	1,265	1	5,056	31,452	**86**
2019	15,895	4,286	3,524	456	211	288	835	1,282	1	5,132	31,909	**87**
2020	16,112	4,344	3,578	463	214	291	847	1,300	1	5,207	32,358	**89**
2021	16,332	4,404	3,629	470	217	295	860	1,318	1	5,280	32,805	**90**
2022	16,555	4,464	3,674	476	220	299	870	1,335	1	5,353	33,248	**91**
2023	16,785	4,526	3,718	481	222	304	881	1,354	1	5,427	33,699	**92**
2024	17,025	4,591	3,761	487	225	308	891	1,373	1	5,502	34,163	**94**
2025	17,273	4,658	3,806	493	227	312	901	1,393	1	5,580	34,645	**95**
2026	17,530	4,727	3,849	498	230	317	911	1,414	1	5,660	35,137	**96**
2027	17,795	4,798	3,892	504	233	322	922	1,436	1	5,742	35,643	**98**
2028	18,070	4,872	3,938	510	235	327	933	1,458	1	5,827	36,170	**99**
2029	18,356	4,950	3,984	516	238	332	943	1,481	1	5,915	36,715	**101**
2030	18,650	5,029	4,027	521	241	337	954	1,505	1	6,005	37,270	**102**
2031	18,941	5,107	4,073	527	243	343	965	1,528	1	6,093	37,820	**104**
2032	19,229	5,185	4,117	533	246	348	975	1,551	1	6,181	38,365	**105**
2033	19,518	5,263	4,162	539	249	353	986	1,575	1	6,269	38,913	**107**
2034	19,806	5,341	4,206	545	251	358	996	1,598	1	6,357	39,459	**108**
2035	20,096	5,419	4,251	550	254	364	1,007	1,621	1	6,445	40,007	**110**
2036	20,385	5,497	4,297	556	257	369	1,018	1,644	1	6,533	40,556	**111**
2037	20,673	5,574	4,342	562	260	374	1,028	1,668	1	6,621	41,104	**113**
2038	20,962	5,652	4,388	568	262	379	1,039	1,691	1	6,709	41,653	**114**
2039	21,248	5,729	4,433	574	265	384	1,050	1,714	1	6,797	42,196	**116**
2040	21,535	5,807	4,481	580	268	390	1,061	1,737	1	6,884	42,745	**117**
2041	21,820	5,883	4,527	586	271	395	1,072	1,760	1	6,972	43,287	**119**
2042	22,101	5,959	4,573	592	273	400	1,083	1,783	1	7,058	43,823	**120**
2043	22,377	6,034	4,619	598	276	405	1,094	1,805	1	7,143	44,351	**122**
2044	22,649	6,107	4,664	604	279	410	1,105	1,827	1	7,226	44,871	**123**
2045	22,918	6,180	4,709	610	281	415	1,115	1,849	1	7,309	45,386	**124**
2046	23,181	6,251	4,752	615	284	419	1,125	1,870	1	7,390	45,889	**126**
2047	23,440	6,320	4,795	621	287	424	1,136	1,891	1	7,470	46,385	**127**
2048	23,696	6,389	4,838	626	289	429	1,146	1,912	1	7,549	46,874	**128**
2049	23,948	6,457	4,879	632	292	433	1,156	1,932	1	7,626	47,354	**130**
2050	24,195	6,524	4,920	637	294	438	1,165	1,952	1	7,702	47,828	**131**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Irrigation	Other	New Commercial	Self Supplied	NRW	Total	AADD (MGD)
2015	2,472	454	709	1,814	110	29	0	524	1,094	7,206	20
2016	2,586	470	730	1,870	114	30	0	518	1,132	7,450	20
2017	2,696	485	747	1,914	116	31	0	513	1,167	7,670	21
2018	2,801	500	760	1,946	118	32	0	508	1,199	7,864	22
2019	2,901	513	772	1,976	120	33	0	503	1,226	8,045	22
2020	2,997	527	782	2,002	122	34	0	498	1,252	8,214	23
2021	3,090	539	792	2,029	123	35	0	493	1,277	8,379	23
2022	3,179	552	802	2,053	125	35	0	488	1,300	8,534	23
2023	3,267	564	812	2,079	126	36	0	483	1,323	8,692	24
2024	3,354	576	821	2,103	128	37	0	478	1,347	8,845	24
2025	3,439	587	831	2,128	129	38	0	474	1,370	8,996	25
2026	3,524	599	840	2,152	131	38	0	469	1,392	9,147	25
2027	3,609	611	850	2,178	132	39	0	464	1,415	9,299	25
2028	3,694	622	860	2,203	134	40	0	460	1,438	9,451	26
2029	3,779	634	870	2,227	135	41	0	455	1,461	9,602	26
2030	3,864	646	879	2,252	137	41	0	450	1,484	9,754	27
2031	3,945	657	889	2,276	138	42	0	446	1,506	9,899	27
2032	4,023	668	898	2,300	140	43	0	441	1,527	10,040	28
2033	4,099	678	907	2,323	141	43	0	437	1,547	10,176	28
2034	4,173	688	916	2,346	143	44	0	433	1,567	10,310	28
2035	4,244	698	925	2,369	144	45	0	428	1,587	10,439	29
2036	4,313	707	934	2,391	145	45	0	424	1,606	10,566	29
2037	4,380	716	943	2,414	147	46	0	420	1,624	10,690	29
2038	4,445	725	951	2,436	148	46	0	416	1,642	10,810	30
2039	4,509	734	960	2,457	149	47	0	411	1,660	10,928	30
2040	4,571	742	969	2,480	151	48	0	407	1,677	11,045	30
2041	4,631	750	978	2,504	152	48	0	403	1,695	11,161	31
2042	4,689	758	986	2,525	154	49	0	399	1,711	11,272	31
2043	4,746	766	995	2,548	155	49	0	395	1,728	11,382	31
2044	4,801	773	1,004	2,571	156	50	0	391	1,744	11,491	31
2045	4,855	780	1,013	2,594	158	50	0	387	1,760	11,598	32
2046	4,907	787	1,022	2,616	159	50	0	384	1,776	11,702	32
2047	4,959	794	1,030	2,639	160	51	0	380	1,791	11,805	32
2048	5,010	801	1,039	2,661	162	51	0	376	1,807	11,907	33
2049	5,060	808	1,048	2,684	163	52	0	372	1,822	12,009	33
2050	5,110	815	1,057	2,707	165	52	0	368	1,837	12,111	33

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	4,088	787	600	140	9	200	205	293	1	2,100	8,423	**23**
2016	4,231	811	619	145	9	207	211	290	1	2,165	8,690	**24**
2017	4,372	835	635	148	9	212	217	287	1	2,230	8,948	**25**
2018	4,508	858	647	151	10	216	223	285	1	2,293	9,191	**25**
2019	4,639	881	658	154	10	220	229	282	1	2,351	9,424	**26**
2020	4,766	902	668	156	10	223	235	279	1	2,407	9,646	**26**
2021	4,888	923	677	158	10	226	240	276	1	2,460	9,860	**27**
2022	5,007	943	686	160	11	229	245	273	1	2,512	10,067	**28**
2023	5,123	963	694	162	11	232	250	271	1	2,563	10,268	**28**
2024	5,237	982	701	164	11	234	255	268	1	2,612	10,465	**29**
2025	5,351	1,001	708	165	11	237	260	265	1	2,660	10,660	**29**
2026	5,462	1,020	716	167	11	239	265	263	1	2,708	10,853	**30**
2027	5,574	1,039	724	169	12	242	270	260	1	2,756	11,046	**30**
2028	5,684	1,058	732	171	12	245	275	257	1	2,804	11,238	**31**
2029	5,795	1,077	740	173	12	248	280	255	1	2,852	11,432	**31**
2030	5,905	1,095	749	175	12	250	285	252	1	2,900	11,625	**32**
2031	6,011	1,113	757	177	12	253	290	250	1	2,946	11,809	**32**
2032	6,111	1,130	765	179	13	256	294	247	1	2,989	11,985	**33**
2033	6,208	1,146	773	180	13	258	298	245	1	3,032	12,155	**33**
2034	6,301	1,162	781	182	13	261	302	242	1	3,072	12,318	**34**
2035	6,391	1,177	789	184	13	264	306	240	1	3,111	12,476	**34**
2036	6,477	1,192	797	186	13	266	310	237	1	3,149	12,628	**35**
2037	6,559	1,206	804	188	13	269	314	235	1	3,185	12,774	**35**
2038	6,639	1,219	811	189	14	271	317	233	1	3,220	12,914	**35**
2039	6,715	1,232	819	191	14	274	320	230	1	3,254	13,049	**36**
2040	6,788	1,244	826	193	14	276	324	228	1	3,286	13,179	**36**
2041	6,858	1,256	833	195	14	279	327	226	1	3,317	13,305	**36**
2042	6,925	1,267	840	196	14	281	330	224	1	3,347	13,424	**37**
2043	6,989	1,277	847	198	14	283	332	221	1	3,375	13,537	**37**
2044	7,049	1,287	854	199	14	285	335	219	1	3,402	13,645	**37**
2045	7,106	1,297	860	201	15	287	337	217	1	3,427	13,748	**38**
2046	7,161	1,306	866	202	15	289	340	215	1	3,452	13,845	**38**
2047	7,213	1,314	871	203	15	291	342	213	1	3,475	13,938	**38**
2048	7,262	1,323	877	205	15	293	344	211	1	3,497	14,027	**38**
2049	7,310	1,331	882	206	15	295	346	208	1	3,518	14,113	**39**
2050	7,357	1,338	888	207	15	297	348	206	1	3,539	14,196	**39**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)									
	Single Family	Multifamily	Commercial	Municipal	Irrigation	New Commercial	Self Supplied	NRW	Total	AADD (MGD)
2015	2,527	228	376	213	32	1	83	1,087	4,547	**12**
2016	2,585	233	376	217	34	1	82	1,110	4,639	**13**
2017	2,650	239	376	223	35	1	81	1,135	4,739	**13**
2018	2,719	245	376	228	36	1	80	1,161	4,845	**13**
2019	2,791	251	376	234	37	1	80	1,187	4,956	**14**
2020	2,864	257	376	240	38	1	79	1,214	5,069	**14**
2021	2,939	263	376	246	38	1	78	1,242	5,182	**14**
2022	3,013	270	376	252	39	1	77	1,269	5,297	**15**
2023	3,088	276	376	257	40	1	77	1,296	5,411	**15**
2024	3,163	282	376	263	40	1	76	1,323	5,526	**15**
2025	3,239	289	376	270	41	1	75	1,351	5,642	**15**
2026	3,316	296	376	276	41	1	74	1,379	5,759	**16**
2027	3,395	302	376	282	42	1	74	1,408	5,879	**16**
2028	3,475	309	376	288	42	1	73	1,437	6,001	**16**
2029	3,557	316	376	295	43	1	72	1,467	6,126	**17**
2030	3,641	323	376	302	44	1	71	1,498	6,255	**17**
2031	3,723	330	376	308	44	1	71	1,528	6,382	**17**
2032	3,806	337	376	315	45	1	70	1,558	6,508	**18**
2033	3,887	344	376	321	45	1	69	1,588	6,632	**18**
2034	3,968	351	376	328	46	1	69	1,617	6,756	**19**
2035	4,049	358	376	334	47	1	68	1,647	6,880	**19**
2036	4,130	365	376	341	47	1	67	1,676	7,004	**19**
2037	4,211	372	376	347	48	1	66	1,706	7,127	**20**
2038	4,291	379	376	353	49	1	66	1,735	7,250	**20**
2039	4,370	386	376	360	49	1	65	1,764	7,371	**20**
2040	4,448	392	376	366	50	1	65	1,792	7,491	**21**
2041	4,525	399	376	372	50	1	64	1,821	7,608	**21**
2042	4,601	405	376	378	51	1	63	1,848	7,723	**21**
2043	4,674	412	376	384	52	1	63	1,875	7,836	**21**
2044	4,745	418	376	390	52	1	62	1,901	7,945	**22**
2045	4,815	424	376	395	53	1	61	1,926	8,051	**22**
2046	4,882	430	376	401	53	1	61	1,950	8,153	**22**
2047	4,947	435	376	406	54	1	60	1,974	8,252	**23**
2048	5,009	440	376	411	54	1	60	1,997	8,347	**23**
2049	5,069	445	376	415	54	1	59	2,019	8,439	**23**
2050	5,127	450	376	420	55	1	58	2,040	8,527	**23**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family Residential	Multi Family Residential	Commercial	Institutional	Industrial	Irrigation	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	1,854	209	485	56	84	52	345	229	1	1,366	4,681	13
2016	1,889	212	502	57	87	54	350	227	1	1,388	4,767	13
2017	1,927	216	516	58	89	55	356	225	1	1,415	4,857	13
2018	1,965	220	527	59	91	56	362	223	1	1,442	4,946	14
2019	2,005	223	536	60	92	57	368	220	1	1,468	5,032	14
2020	2,045	227	544	61	94	58	375	218	1	1,494	5,116	14
2021	2,084	231	552	62	95	59	381	216	1	1,518	5,199	14
2022	2,123	235	558	63	96	60	387	214	1	1,542	5,279	14
2023	2,162	238	565	64	97	60	393	212	1	1,565	5,358	15
2024	2,201	242	571	65	99	61	399	210	1	1,588	5,437	15
2025	2,240	246	578	66	100	62	405	208	1	1,612	5,516	15
2026	2,280	250	584	67	101	62	412	205	1	1,635	5,597	15
2027	2,321	253	591	68	102	63	418	203	1	1,659	5,679	16
2028	2,363	257	598	69	103	64	424	201	1	1,684	5,764	16
2029	2,405	261	605	70	104	64	431	199	1	1,709	5,851	16
2030	2,449	266	612	71	106	65	438	197	1	1,735	5,940	16
2031	2,491	270	619	73	107	66	445	195	1	1,760	6,026	17
2032	2,533	274	626	74	108	67	451	193	1	1,785	6,111	17
2033	2,574	278	633	75	109	67	458	191	1	1,810	6,195	17
2034	2,615	282	639	76	110	68	464	190	1	1,834	6,279	17
2035	2,656	285	646	77	111	69	471	188	1	1,858	6,363	17
2036	2,697	289	653	78	113	70	477	186	1	1,883	6,446	18
2037	2,737	293	660	79	114	70	484	184	1	1,907	6,528	18
2038	2,777	297	667	80	115	71	490	182	1	1,931	6,610	18
2039	2,817	301	674	81	116	72	496	180	1	1,955	6,692	18
2040	2,857	305	681	82	117	73	502	178	1	1,978	6,774	19
2041	2,896	308	688	83	119	73	509	177	1	2,002	6,855	19
2042	2,935	312	694	84	120	74	515	175	1	2,025	6,935	19
2043	2,973	316	701	85	121	75	521	173	1	2,048	7,014	19
2044	3,011	320	708	86	122	75	527	171	1	2,071	7,092	19
2045	3,049	323	715	87	123	76	533	170	1	2,094	7,170	20
2046	3,086	327	721	88	124	77	539	168	1	2,116	7,246	20
2047	3,123	330	727	89	125	78	545	166	1	2,138	7,321	20
2048	3,159	334	733	90	126	78	550	165	1	2,160	7,395	20
2049	3,196	337	739	91	127	79	556	163	1	2,182	7,470	20
2050	3,232	341	746	92	129	79	562	161	1	2,203	7,545	21

Attachment 7

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multi Family	Commercial	Industrial	Irrigation	Agricultural	Self Supplied	New Commercial	Anheuser-Busch	NRW	Total	AADD (MGD)
2015	2,003	222	392	2,103	23	17	207	4	1,826	2,991	9,787	**27**
2016	2,028	225	399	2,139	23	17	206	101	1,826	3,022	9,985	**27**
2017	2,053	227	404	2,164	23	17	205	169	1,826	3,083	10,170	**28**
2018	2,078	229	406	2,178	24	17	204	208	1,826	3,140	10,309	**28**
2019	2,102	232	409	2,191	24	17	203	243	1,826	3,181	10,426	**29**
2020	2,126	234	411	2,203	24	17	202	277	1,826	3,217	10,536	**29**
2021	2,150	236	413	2,217	24	17	201	315	1,826	3,250	10,649	**29**
2022	2,174	238	416	2,230	24	17	200	351	1,826	3,285	10,760	**29**
2023	2,198	241	419	2,244	24	17	199	392	1,826	3,319	10,879	**30**
2024	2,221	243	421	2,257	24	17	198	427	1,826	3,353	10,985	**30**
2025	2,243	245	423	2,270	25	17	197	461	1,826	3,385	11,090	**30**
2026	2,264	247	425	2,281	25	17	196	494	1,826	3,416	11,189	**31**
2027	2,285	249	428	2,294	25	17	195	530	1,826	3,446	11,293	**31**
2028	2,306	250	430	2,308	25	17	194	568	1,826	3,478	11,401	**31**
2029	2,326	252	433	2,321	25	17	193	603	1,826	3,511	11,507	**32**
2030	2,347	254	435	2,333	25	17	192	638	1,826	3,543	11,611	**32**
2031	2,366	256	438	2,351	25	17	191	686	1,826	3,571	11,727	**32**
2032	2,384	258	442	2,369	26	17	190	735	1,826	3,607	11,852	**32**
2033	2,402	259	445	2,386	26	17	189	783	1,826	3,645	11,977	**33**
2034	2,420	261	448	2,402	26	17	188	828	1,826	3,683	12,100	**33**
2035	2,438	263	451	2,418	26	17	187	873	1,826	3,721	12,220	**33**
2036	2,454	264	454	2,433	26	17	186	915	1,826	3,754	12,329	**34**
2037	2,470	265	456	2,448	26	17	185	954	1,826	3,788	12,435	**34**
2038	2,485	267	459	2,462	27	17	184	994	1,826	3,820	12,542	**34**
2039	2,501	268	462	2,476	27	17	183	1,031	1,826	3,853	12,644	**35**
2040	2,517	270	465	2,491	27	17	182	1,075	1,826	3,884	12,753	**35**
2041	2,531	271	467	2,505	27	17	182	1,112	1,826	3,915	12,853	**35**
2042	2,545	272	470	2,518	27	17	181	1,148	1,826	3,946	12,949	**35**
2043	2,559	274	472	2,532	27	17	180	1,186	1,826	3,975	13,047	**36**
2044	2,573	275	475	2,545	28	17	179	1,224	1,826	4,005	13,146	**36**
2045	2,587	276	477	2,559	28	17	178	1,261	1,826	4,035	13,243	**36**
2046	2,600	277	479	2,570	28	17	177	1,293	1,826	4,064	13,331	**37**
2047	2,613	278	481	2,582	28	17	176	1,325	1,826	4,091	13,417	**37**
2048	2,626	280	483	2,592	28	17	175	1,352	1,826	4,117	13,496	**37**
2049	2,639	281	485	2,602	28	17	174	1,380	1,826	4,141	13,573	**37**
2050	2,652	282	487	2,612	28	17	174	1,407	1,826	4,165	13,648	**37**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)												
	Single Family	Multifamily	Commercial	Institutional	Industrial	Irrigation	Agricultural	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	3,950	563	245	50	223	250	99	152	365	1	1,184	7,081	**19**
2016	4,055	576	253	51	230	259	99	155	363	1	1,211	7,254	**20**
2017	4,160	589	260	52	236	265	99	159	361	1	1,240	7,422	**20**
2018	4,265	603	264	53	240	270	99	162	359	1	1,268	7,584	**21**
2019	4,379	617	269	54	245	274	99	166	358	1	1,298	7,760	**21**
2020	4,494	631	273	56	248	278	99	170	356	1	1,328	7,933	**22**
2021	4,608	646	277	57	252	282	99	174	354	1	1,356	8,106	**22**
2022	4,723	660	280	58	255	286	99	178	352	1	1,385	8,277	**23**
2023	4,837	675	283	60	258	289	99	182	351	1	1,414	8,448	**23**
2024	4,963	691	287	61	261	293	99	186	349	1	1,445	8,637	**24**
2025	5,089	707	291	62	265	297	99	190	347	1	1,477	8,826	**24**
2026	5,218	723	295	64	269	302	99	195	345	1	1,509	9,020	**25**
2027	5,348	740	300	65	273	306	99	199	344	1	1,542	9,216	**25**
2028	5,477	756	304	67	277	311	99	204	342	1	1,574	9,411	**26**
2029	5,606	772	309	68	281	315	99	208	340	1	1,607	9,606	**26**
2030	5,735	789	313	70	285	320	99	212	338	1	1,640	9,801	**27**
2031	5,873	806	318	71	289	325	99	217	337	1	1,675	10,011	**27**
2032	6,011	824	323	73	294	330	99	222	335	1	1,709	10,221	**28**
2033	6,148	841	328	74	299	335	99	227	333	1	1,745	10,431	**29**
2034	6,286	859	334	76	304	341	99	231	332	1	1,780	10,641	**29**
2035	6,424	876	339	77	309	346	99	236	330	1	1,815	10,852	**30**
2036	6,570	895	345	79	314	353	99	241	328	1	1,852	11,078	**30**
2037	6,717	913	352	81	320	359	99	246	327	1	1,890	11,304	**31**
2038	6,863	932	358	82	326	365	99	251	325	1	1,928	11,530	**32**
2039	7,010	951	364	84	331	372	99	256	323	1	1,966	11,756	**32**
2040	7,156	969	371	86	337	378	99	261	322	1	2,003	11,983	**33**
2041	7,313	989	374	87	341	382	99	266	320	1	2,044	12,218	**33**
2042	7,470	1,009	379	89	345	387	99	272	319	1	2,083	12,454	**34**
2043	7,628	1,029	384	91	350	393	99	277	317	1	2,123	12,692	**35**
2044	7,785	1,049	390	93	355	398	99	283	315	1	2,163	12,930	**35**
2045	7,942	1,069	395	94	360	404	99	288	314	1	2,202	13,169	**36**
2046	8,114	1,091	402	96	365	410	99	294	312	1	2,246	13,431	**37**
2047	8,286	1,113	407	98	371	416	99	300	311	1	2,290	13,692	**38**
2048	8,458	1,135	413	100	376	422	99	306	309	1	2,334	13,952	**38**
2049	8,630	1,157	418	102	381	427	99	312	308	1	2,377	14,212	**39**
2050	8,802	1,179	423	104	385	432	99	318	306	1	2,420	14,469	**40**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Agricultural	Other	Comme	NRW	Total	AADD (MGD)
2015	3,948	1,821	999	413	836	3	19	1	869	8,910	24
2016	3,987	1,839	999	425	845	3	20	166	878	9,162	25
2017	4,027	1,858	999	434	853	3	20	294	903	9,390	26
2018	4,067	1,876	999	440	862	3	20	382	925	9,574	26
2019	4,101	1,892	999	445	869	3	20	452	942	9,724	27
2020	4,136	1,908	999	449	876	3	20	511	957	9,858	27
2021	4,170	1,924	999	453	883	3	20	568	970	9,991	27
2022	4,204	1,939	999	457	891	3	21	621	983	10,118	28
2023	4,239	1,955	999	460	898	3	21	667	995	10,237	28
2024	4,268	1,969	999	463	904	3	21	708	1,006	10,341	28
2025	4,298	1,982	999	466	911	3	21	753	1,016	10,449	29
2026	4,325	1,995	999	469	916	3	21	793	1,026	10,548	29
2027	4,352	2,007	999	472	922	3	21	836	1,035	10,649	29
2028	4,379	2,020	999	476	928	3	21	881	1,045	10,752	29
2029	4,406	2,033	999	479	934	3	22	923	1,055	10,853	30
2030	4,433	2,045	999	481	939	3	22	963	1,065	10,952	30
2031	4,455	2,055	999	484	944	3	22	995	1,073	11,030	30
2032	4,476	2,065	999	486	948	3	22	1,029	1,081	11,109	30
2033	4,497	2,074	999	489	953	3	22	1,064	1,089	11,190	31
2034	4,518	2,084	999	491	957	3	22	1,097	1,097	11,269	31
2035	4,539	2,094	999	493	962	3	22	1,130	1,104	11,347	31
2036	4,555	2,101	999	495	965	3	22	1,154	1,111	11,405	31
2037	4,570	2,108	999	496	968	3	22	1,175	1,116	11,459	31
2038	4,586	2,115	999	498	972	3	22	1,196	1,122	11,513	32
2039	4,601	2,123	999	499	975	3	23	1,216	1,127	11,565	32
2040	4,617	2,130	999	501	978	3	23	1,240	1,132	11,622	32
2041	4,627	2,135	999	502	980	3	23	1,255	1,136	11,661	32
2042	4,638	2,140	999	503	983	3	23	1,268	1,140	11,696	32
2043	4,649	2,144	999	504	985	3	23	1,284	1,144	11,735	32
2044	4,659	2,149	999	505	987	3	23	1,300	1,147	11,774	32
2045	4,670	2,154	999	507	989	3	23	1,318	1,151	11,815	32
2046	4,677	2,158	999	507	991	3	23	1,329	1,154	11,842	32
2047	4,685	2,161	999	508	993	3	23	1,342	1,157	11,871	33
2048	4,692	2,164	999	509	994	3	23	1,354	1,160	11,899	33
2049	4,700	2,168	999	510	996	3	23	1,365	1,163	11,926	33
2050	4,707	2,171	999	511	997	3	23	1,378	1,165	11,954	33

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercia	NRW	Total	AADD (MGD)
2015	12,497	3,621	5,223	682	392	0	779	1	1	2,190	25,385	**70**
2016	12,656	3,667	5,436	691	408	0	811	1	1	2,218	25,887	**71**
2017	12,814	3,712	5,610	699	421	0	837	1	1	2,261	26,355	**72**
2018	12,972	3,758	5,744	708	431	0	857	1	1	2,302	26,773	**73**
2019	13,121	3,801	5,857	716	439	0	874	1	1	2,336	27,147	**74**
2020	13,270	3,845	5,956	724	447	0	889	1	1	2,369	27,500	**75**
2021	13,419	3,888	6,048	732	453	0	902	1	1	2,399	27,843	**76**
2022	13,568	3,931	6,128	740	459	0	914	1	1	2,429	28,170	**77**
2023	13,717	3,974	6,206	749	465	0	926	1	1	2,457	28,494	**78**
2024	13,855	4,014	6,276	756	470	0	936	1	1	2,483	28,793	**79**
2025	13,994	4,054	6,344	764	476	0	946	1	1	2,509	29,088	**80**
2026	14,127	4,093	6,402	771	480	0	955	1	1	2,533	29,363	**80**
2027	14,261	4,132	6,458	778	484	0	963	1	1	2,557	29,635	81
2028	14,394	4,170	6,515	786	488	0	972	1	1	2,581	29,908	**82**
2029	14,528	4,209	6,566	793	492	0	980	1	1	2,604	30,174	**83**
2030	14,661	4,248	6,612	800	496	0	986	1	1	2,627	30,432	**83**
2031	14,782	4,283	6,656	807	499	0	993	1	1	2,647	30,667	**84**
2032	14,903	4,318	6,698	813	502	0	999	1	1	2,667	30,902	**85**
2033	15,023	4,353	6,743	820	506	0	1,006	1	1	2,688	31,140	**85**
2034	15,144	4,387	6,788	826	509	0	1,013	1	1	2,708	31,377	**86**
2035	15,265	4,422	6,834	833	512	0	1,019	1	1	2,728	31,616	**87**
2036	15,372	4,454	6,874	839	515	0	1,025	1	1	2,747	31,828	**87**
2037	15,480	4,485	6,914	845	518	0	1,031	1	1	2,765	32,040	**88**
2038	15,587	4,516	6,954	851	521	0	1,037	1	1	2,783	32,252	**88**
2039	15,695	4,547	6,993	857	524	0	1,043	1	1	2,802	32,462	**89**
2040	15,802	4,578	7,037	862	528	0	1,050	1	1	2,820	32,679	**90**
2041	15,898	4,606	7,074	868	530	0	1,055	1	1	2,836	32,869	**90**
2042	15,993	4,633	7,113	873	533	0	1,061	1	1	2,853	33,061	**91**
2043	16,088	4,661	7,154	878	536	0	1,067	1	1	2,869	33,255	**91**
2044	16,183	4,689	7,197	883	540	0	1,074	1	1	2,886	33,453	**92**
2045	16,279	4,716	7,241	888	543	0	1,080	1	1	2,903	33,652	**92**
2046	16,366	4,741	7,283	893	546	0	1,087	1	1	2,919	33,837	**93**
2047	16,453	4,767	7,327	898	549	0	1,093	1	1	2,935	34,024	**93**
2048	16,540	4,792	7,372	903	553	0	1,100	1	1	2,951	34,211	**94**
2049	16,627	4,817	7,418	907	556	0	1,107	1	1	2,967	34,401	**94**
2050	16,714	4,842	7,466	912	560	0	1,114	1	1	2,983	34,593	**95**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercia	Self-Supplied	NRW	Total	AADD (MGD)
2015	2,234	320	496	66	305	370	181	0	405	483	4,860	**13**
2016	2,292	326	505	68	311	377	185	0	401	493	4,957	**14**
2017	2,349	332	512	69	315	384	187	0	397	502	5,049	**14**
2018	2,407	339	516	70	317	392	189	0	393	512	5,135	14
2019	2,468	345	520	72	320	399	190	0	389	521	5,225	**14**
2020	2,528	352	524	73	322	407	192	0	385	530	5,314	**15**
2021	2,589	359	528	75	325	415	193	0	381	538	5,403	**15**
2022	2,649	365	532	76	327	422	195	0	377	547	5,492	**15**
2023	2,710	372	536	77	329	430	196	0	374	556	5,580	**15**
2024	2,773	379	539	79	332	438	197	0	370	565	5,672	**16**
2025	2,836	386	544	80	334	446	199	0	366	574	5,766	**16**
2026	2,899	393	548	82	337	454	201	0	363	584	5,861	**16**
2027	2,963	400	553	83	340	462	202	0	359	593	5,956	**16**
2028	3,026	407	558	85	343	471	204	0	355	603	6,052	**17**
2029	3,090	414	563	86	346	479	206	0	352	612	6,148	**17**
2030	3,153	421	569	87	350	487	208	0	348	622	6,245	**17**
2031	3,218	428	575	89	353	495	210	0	345	632	6,345	**17**
2032	3,282	435	581	90	357	503	213	0	341	641	6,445	**18**
2033	3,347	442	588	92	361	512	215	0	338	651	6,547	**18**
2034	3,411	450	595	93	366	520	218	0	335	662	6,648	**18**
2035	3,476	457	602	95	370	528	220	0	331	672	6,750	**18**
2036	3,541	464	609	96	375	537	223	0	328	682	6,856	**19**
2037	3,607	471	617	98	379	545	226	0	325	692	6,961	**19**
2038	3,673	479	625	100	384	554	229	0	321	703	7,067	**19**
2039	3,739	486	633	101	389	562	232	0	318	714	7,173	**20**
2040	3,804	493	641	103	394	571	235	0	315	724	7,281	**20**
2041	3,872	501	650	104	400	579	238	0	312	735	7,393	**20**
2042	3,940	509	659	106	406	588	241	0	309	746	7,504	**21**
2043	4,008	516	669	107	411	597	245	0	306	757	7,617	**21**
2044	4,076	524	679	109	417	606	248	0	303	769	7,731	**21**
2045	4,144	532	688	110	423	615	252	0	300	780	7,844	**21**
2046	4,215	540	699	112	430	624	256	0	297	792	7,964	**22**
2047	4,287	548	709	114	436	633	260	0	294	804	8,084	**22**
2048	4,358	556	720	115	443	643	264	0	291	816	8,205	**22**
2049	4,429	564	731	117	450	652	268	0	288	828	8,326	**23**
2050	4,501	572	742	119	456	661	272	0	285	840	8,447	**23**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	t/Condo (MF	Commercial	titutional (S	unicipal (GO	Other	Irrigation	w Commerc	NRW	Total	AADD (MGD)
2015	10,756	3,847	4,889	227	137	26	645	1	5,441	25,969	71
2016	10,852	3,881	5,047	229	138	27	666	1	5,489	26,329	72
2017	10,947	3,915	5,173	231	139	27	683	1	5,564	26,680	73
2018	11,042	3,949	5,265	233	140	27	695	1	5,638	26,990	74
2019	11,121	3,977	5,338	235	141	27	705	1	5,695	27,241	75
2020	11,200	4,006	5,403	237	142	28	713	1	5,748	27,477	75
2021	11,280	4,034	5,464	238	143	28	721	1	5,797	27,707	76
2022	11,359	4,063	5,518	240	144	28	728	1	5,845	27,927	77
2023	11,439	4,091	5,568	242	145	28	735	1	5,892	28,140	77
2024	11,502	4,114	5,604	243	146	28	740	1	5,928	28,307	78
2025	11,566	4,137	5,638	244	147	28	744	1	5,963	28,469	78
2026	11,624	4,157	5,664	246	148	29	748	1	5,994	28,609	78
2027	11,682	4,178	5,688	247	148	29	751	1	6,023	28,747	79
2028	11,739	4,199	5,712	248	149	29	754	1	6,052	28,883	79
2029	11,797	4,219	5,732	249	150	29	757	1	6,081	29,014	79
2030	11,855	4,240	5,747	251	151	29	759	1	6,108	29,139	80
2031	11,897	4,255	5,758	251	151	29	760	1	6,127	29,229	80
2032	11,940	4,270	5,768	252	152	29	761	1	6,146	29,320	80
2033	11,982	4,286	5,782	253	152	29	763	1	6,164	29,414	81
2034	12,025	4,301	5,796	254	153	30	765	1	6,184	29,509	81
2035	12,068	4,316	5,812	255	153	30	767	1	6,204	29,605	81
2036	12,097	4,327	5,821	256	154	30	768	1	6,218	29,670	81
2037	12,127	4,337	5,829	256	154	30	769	1	6,231	29,734	81
2038	12,156	4,348	5,837	257	154	30	770	1	6,245	29,797	82
2039	12,186	4,358	5,842	258	155	30	771	1	6,258	29,858	82
2040	12,215	4,369	5,854	258	155	30	773	1	6,270	29,925	82
2041	12,234	4,376	5,858	259	155	30	773	1	6,279	29,965	82
2042	12,253	4,382	5,864	259	156	30	774	1	6,288	30,007	82
2043	12,272	4,389	5,871	259	156	30	775	1	6,296	30,050	82
2044	12,292	4,396	5,880	260	156	30	776	1	6,305	30,096	82
2045	12,311	4,403	5,889	260	156	30	777	1	6,315	30,143	83
2046	12,322	4,407	5,896	260	157	30	778	1	6,321	30,173	83
2047	12,334	4,411	5,905	261	157	30	779	1	6,327	30,206	83
2048	12,346	4,416	5,914	261	157	30	781	1	6,334	30,239	83
2049	12,358	4,420	5,924	261	157	30	782	1	6,341	30,274	83
2050	12,369	4,424	5,934	261	157	30	783	1	6,348	30,309	83

PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercial	NRW	Total	AADD (MGD)
2015	2,284	546	375	78	114	186	86	0	899	4,567	**13**
2016	2,329	557	390	79	118	189	89	0	917	4,668	**13**
2017	2,373	567	403	81	122	193	92	0	936	4,768	**13**
2018	2,418	578	413	82	125	197	95	0	956	4,863	**13**
2019	2,464	589	422	84	128	200	97	0	976	4,960	**14**
2020	2,510	600	430	85	130	204	99	0	994	5,053	**14**
2021	2,556	611	438	87	133	208	100	0	1,013	5,146	**14**
2022	2,602	622	445	89	135	212	102	0	1,031	5,238	**14**
2023	2,649	633	451	90	137	215	103	0	1,049	5,328	**15**
2024	2,696	645	458	92	139	219	105	0	1,068	5,422	**15**
2025	2,744	656	464	93	141	223	106	0	1,086	5,515	**15**
2026	2,792	668	470	95	143	227	108	0	1,104	5,607	**15**
2027	2,841	679	476	97	144	231	109	0	1,123	5,700	**16**
2028	2,889	691	483	98	146	235	111	0	1,141	5,793	**16**
2029	2,937	702	489	100	148	239	112	0	1,159	5,886	**16**
2030	2,985	714	495	102	150	243	113	0	1,178	5,979	**16**
2031	3,033	725	501	103	152	247	115	0	1,196	6,072	**17**
2032	3,082	737	507	105	154	251	116	0	1,214	6,167	**17**
2033	3,130	749	514	107	156	255	118	0	1,233	6,261	**17**
2034	3,179	760	521	108	158	258	119	0	1,251	6,355	**17**
2035	3,228	772	528	110	160	262	121	0	1,270	6,450	**18**
2036	3,277	784	535	112	162	266	123	0	1,289	6,547	**18**
2037	3,326	795	542	113	164	270	124	0	1,308	6,644	**18**
2038	3,375	807	549	115	166	274	126	0	1,327	6,741	**18**
2039	3,425	819	556	117	169	278	127	0	1,346	6,837	**19**
2040	3,474	831	564	118	171	282	129	0	1,365	6,934	**19**
2041	3,524	843	571	120	173	287	131	0	1,385	7,034	**19**
2042	3,575	855	579	122	176	291	133	0	1,404	7,134	**20**
2043	3,626	867	587	123	178	295	134	0	1,424	7,234	**20**
2044	3,676	879	595	125	180	299	136	0	1,444	7,334	**20**
2045	3,727	891	603	127	183	303	138	0	1,464	7,435	**20**
2046	3,779	904	611	129	185	307	140	0	1,484	7,540	**21**
2047	3,832	916	620	130	188	312	142	0	1,505	7,646	**21**
2048	3,885	929	628	132	191	316	144	0	1,526	7,751	**21**
2049	3,938	942	637	134	193	320	146	0	1,546	7,856	**22**
2050	3,990	954	646	136	196	324	148	0	1,567	7,962	**22**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AADD (MGD)
2015	2,416	157	444	56	29	82	195	478	333	4,189	**11**
2016	2,444	158	460	58	29	85	196	474	335	4,239	**12**
2017	2,472	159	473	60	30	87	198	469	339	4,287	**12**
2018	2,500	160	483	61	30	89	199	464	343	4,329	**12**
2019	2,530	161	491	62	30	90	201	459	346	4,371	**12**
2020	2,559	163	497	63	30	91	202	455	350	4,410	**12**
2021	2,588	164	503	63	31	92	204	450	353	4,448	**12**
2022	2,617	165	507	64	31	93	206	446	356	4,485	**12**
2023	2,646	166	510	64	31	94	207	441	359	4,520	**12**
2024	2,674	168	512	65	31	94	209	437	361	4,552	**12**
2025	2,702	169	514	65	32	95	210	433	364	4,583	**13**
2026	2,728	170	515	65	32	95	211	428	366	4,610	**13**
2027	2,753	171	516	65	32	95	213	424	368	4,638	**13**
2028	2,778	172	517	65	32	95	214	420	371	4,664	**13**
2029	2,804	173	518	65	32	95	216	416	373	4,691	**13**
2030	2,829	174	518	65	33	95	217	411	375	4,717	**13**
2031	2,848	175	517	65	33	95	218	407	376	4,735	**13**
2032	2,868	176	517	65	33	95	219	403	378	4,753	**13**
2033	2,887	177	517	65	33	95	220	399	379	4,771	**13**
2034	2,906	177	517	65	33	95	221	395	381	4,790	**13**
2035	2,925	178	517	65	33	95	222	391	382	4,809	**13**
2036	2,939	179	517	65	33	95	222	387	383	4,821	**13**
2037	2,952	179	517	65	33	95	223	383	384	4,832	**13**
2038	2,966	180	517	65	34	95	223	380	385	4,845	**13**
2039	2,979	180	518	65	34	95	224	376	386	4,857	**13**
2040	2,993	181	519	65	34	96	225	372	387	4,871	**13**
2041	3,002	181	521	66	34	96	225	368	387	4,880	**13**
2042	3,012	181	522	66	34	96	225	365	388	4,889	**13**
2043	3,022	182	523	66	34	96	226	361	389	4,898	**13**
2044	3,032	182	525	66	34	97	226	357	390	4,909	**13**
2045	3,041	182	527	66	34	97	227	354	390	4,919	**13**
2046	3,050	182	530	67	34	97	227	350	391	4,929	**14**
2047	3,060	183	532	67	34	98	227	347	392	4,940	**14**
2048	3,069	183	535	67	34	98	228	343	393	4,950	**14**
2049	3,078	183	537	68	34	99	228	340	394	4,961	**14**
2050	3,087	184	540	68	34	99	228	336	395	4,972	**14**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	Commercial	Industrial	Municipal	Irrigation	Other	New Commercia	Self Supplied	NRW	Total	AADD (MGD)
2015	4,313	910	456	61	253	36	1	194	1,839	8,063	22
2016	4,462	934	468	63	263	38	1	192	1,899	8,319	23
2017	4,611	952	477	65	271	39	1	190	1,958	8,562	23
2018	4,759	963	482	67	277	40	1	188	2,013	8,790	24
2019	4,933	977	489	69	283	41	1	186	2,075	9,054	25
2020	5,107	989	495	72	288	43	1	184	2,135	9,314	26
2021	5,281	1,000	501	74	293	44	1	182	2,194	9,571	26
2022	5,455	1,012	507	76	299	46	1	180	2,252	9,828	27
2023	5,630	1,023	512	79	303	47	1	179	2,311	10,084	28
2024	5,824	1,037	519	81	308	48	1	177	2,377	10,372	28
2025	6,018	1,051	526	84	313	50	1	175	2,442	10,660	29
2026	6,224	1,067	535	87	318	52	1	173	2,512	10,969	30
2027	6,430	1,084	543	90	323	53	1	172	2,582	11,278	31
2028	6,637	1,102	552	92	328	55	1	170	2,653	11,589	32
2029	6,843	1,119	561	95	334	57	1	168	2,723	11,900	33
2030	7,049	1,137	569	98	339	58	1	166	2,794	12,211	33
2031	7,285	1,161	581	101	344	60	1	165	2,876	12,574	34
2032	7,521	1,186	594	104	349	62	1	163	2,959	12,939	35
2033	7,757	1,212	607	107	354	64	1	161	3,042	13,305	36
2034	7,993	1,239	621	111	359	66	1	160	3,125	13,674	37
2035	8,229	1,268	635	114	364	68	1	158	3,209	14,046	38
2036	8,493	1,302	652	117	369	70	1	157	3,305	14,466	40
2037	8,758	1,337	670	121	374	72	1	155	3,401	14,889	41
2038	9,023	1,374	688	125	379	74	1	154	3,497	15,313	42
2039	9,287	1,410	706	128	384	76	1	152	3,594	15,738	43
2040	9,552	1,449	725	132	389	78	1	151	3,690	16,167	44
2041	9,849	1,495	749	136	394	81	1	149	3,801	16,654	46
2042	10,147	1,542	772	140	400	83	1	148	3,912	17,143	47
2043	10,444	1,590	796	144	405	86	1	146	4,023	17,635	48
2044	10,741	1,641	822	148	410	88	1	145	4,135	18,131	50
2045	11,039	1,694	848	152	416	90	1	143	4,249	18,631	51
2046	11,379	1,756	879	156	422	93	1	142	4,379	19,207	53
2047	11,719	1,822	913	161	428	96	1	140	4,510	19,790	54
2048	12,059	1,894	948	166	435	99	1	139	4,644	20,384	56
2049	12,399	1,973	988	170	443	101	1	137	4,779	20,992	58
2050	12,739	2,062	1,032	175	453	104	1	136	4,918	21,620	59

	PROJECTED BASEFLOW WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AADD (MGD)
2015	14,658	8,405	13,027	233	621	783	53	173	234	12,600	50,787	**139**
2016	14,911	8,546	13,450	237	641	796	55	176	231	12,812	51,855	**142**
2017	15,164	8,688	13,792	241	657	809	57	179	229	13,078	52,893	**145**
2018	15,417	8,829	14,055	245	670	822	58	182	227	13,336	53,840	**148**
2019	15,672	8,973	14,300	249	681	836	59	185	224	13,574	54,753	**150**
2020	15,928	9,116	14,524	253	692	849	60	187	222	13,801	55,632	**152**
2021	16,184	9,259	14,748	257	703	862	60	190	220	14,019	56,503	**155**
2022	16,440	9,402	14,962	261	713	876	61	193	218	14,235	57,361	**157**
2023	16,696	9,546	15,184	265	724	889	62	196	216	14,448	58,225	**160**
2024	16,952	9,690	15,407	269	734	903	63	199	213	14,663	59,094	**162**
2025	17,209	9,833	15,625	273	745	916	64	202	211	14,878	59,957	**164**
2026	17,466	9,977	15,827	277	754	929	65	205	209	15,093	60,802	**167**
2027	17,723	10,121	16,028	281	764	943	66	208	207	15,302	61,642	**169**
2028	17,979	10,265	16,239	285	774	956	67	211	205	15,510	62,491	**171**
2029	18,236	10,409	16,435	289	783	970	67	214	203	15,721	63,327	**173**
2030	18,493	10,553	16,619	293	792	983	68	217	201	15,928	64,146	**176**
2031	18,749	10,696	16,815	297	801	996	69	220	199	16,131	64,975	**178**
2032	19,006	10,840	17,010	301	811	1,010	70	223	197	16,337	65,804	**180**
2033	19,263	10,984	17,221	305	821	1,023	71	226	195	16,542	66,650	**183**
2034	19,519	11,128	17,433	309	831	1,037	71	229	193	16,752	67,502	**185**
2035	19,776	11,272	17,650	313	841	1,050	72	232	191	16,963	68,360	**187**
2036	20,033	11,416	17,869	317	851	1,063	73	235	189	17,177	69,224	**190**
2037	20,290	11,560	18,089	321	862	1,077	74	238	187	17,391	70,090	**192**
2038	20,548	11,705	18,310	325	873	1,090	75	241	185	17,606	70,957	**194**
2039	20,805	11,849	18,528	329	883	1,104	76	244	183	17,821	71,821	**197**
2040	21,062	11,993	18,763	333	894	1,117	77	247	182	18,035	72,703	**199**
2041	21,321	12,138	18,995	337	905	1,131	78	250	180	18,256	73,591	**202**
2042	21,580	12,284	19,232	341	916	1,144	79	253	178	18,476	74,482	**204**
2043	21,839	12,429	19,471	345	928	1,158	80	256	176	18,697	75,379	**207**
2044	22,098	12,574	19,716	349	939	1,171	81	259	175	18,919	76,282	**209**
2045	22,357	12,720	19,965	353	951	1,185	82	262	173	19,144	77,190	**211**
2046	22,621	12,868	20,223	357	964	1,199	83	265	171	19,373	78,123	**214**
2047	22,884	13,016	20,486	362	976	1,212	84	268	169	19,605	79,061	**217**
2048	23,148	13,164	20,750	366	989	1,226	85	271	168	19,838	80,004	**219**
2049	23,412	13,312	21,022	370	1,002	1,240	86	274	166	20,072	80,955	**222**
2050	23,676	13,460	21,300	374	1,015	1,254	87	277	164	20,308	81,914	**224**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercial	NRW	Total	AAD (MGD)
2015	15,093	4,070	3,196	414	191	273	757	1,218	1	4,837	30,050	**82**
2016	15,394	4,151	3,329	431	199	278	788	1,242	1	4,934	30,746	**84**
2017	15,694	4,232	3,441	446	206	284	815	1,266	1	5,046	31,430	**86**
2018	15,994	4,313	3,531	457	211	289	836	1,290	1	5,156	32,079	**88**
2019	16,307	4,397	3,615	468	216	295	856	1,315	1	5,265	32,736	**90**
2020	16,619	4,481	3,691	478	221	301	874	1,341	1	5,371	33,376	**91**
2021	16,931	4,565	3,763	487	225	306	891	1,366	1	5,474	34,009	**93**
2022	17,243	4,650	3,827	496	229	312	906	1,391	1	5,576	34,630	**95**
2023	17,556	4,734	3,889	504	232	318	921	1,416	1	5,676	35,245	**97**
2024	17,881	4,822	3,951	512	236	323	936	1,442	1	5,779	35,882	**98**
2025	18,207	4,909	4,012	519	240	329	950	1,469	1	5,882	36,517	**100**
2026	18,535	4,998	4,069	527	243	335	964	1,495	1	5,985	37,152	**102**
2027	18,863	5,086	4,126	534	247	341	977	1,522	1	6,087	37,783	**104**
2028	19,191	5,175	4,182	542	250	347	991	1,548	1	6,188	38,415	**105**
2029	19,520	5,263	4,236	549	253	353	1,003	1,575	1	6,290	39,042	**107**
2030	19,848	5,352	4,286	555	256	359	1,015	1,601	1	6,391	39,663	**109**
2031	20,181	5,442	4,339	562	259	365	1,028	1,628	1	6,492	40,297	**110**
2032	20,514	5,531	4,392	569	262	371	1,040	1,655	1	6,594	40,929	**112**
2033	20,847	5,621	4,445	576	266	377	1,053	1,682	1	6,696	41,564	**114**
2034	21,181	5,711	4,498	582	269	383	1,065	1,709	1	6,798	42,197	**116**
2035	21,514	5,801	4,551	589	272	389	1,078	1,736	1	6,900	42,831	**117**
2036	21,850	5,892	4,606	596	275	395	1,091	1,763	1	7,003	43,471	**119**
2037	22,186	5,982	4,660	603	279	401	1,104	1,790	1	7,106	44,111	**121**
2038	22,522	6,073	4,715	611	282	407	1,117	1,817	1	7,209	44,753	**123**
2039	22,858	6,163	4,769	617	285	414	1,129	1,844	1	7,312	45,392	**124**
2040	23,194	6,254	4,826	625	288	420	1,143	1,871	1	7,415	46,037	**126**
2041	23,535	6,346	4,883	632	292	426	1,157	1,899	1	7,520	46,691	**128**
2042	23,877	6,438	4,941	640	295	432	1,170	1,926	1	7,625	47,345	**130**
2043	24,218	6,530	4,999	647	299	438	1,184	1,954	1	7,731	48,000	**132**
2044	24,559	6,622	5,057	655	302	444	1,198	1,981	1	7,836	48,656	**133**
2045	24,901	6,714	5,116	662	306	450	1,212	2,009	1	7,942	49,312	**135**
2046	25,254	6,810	5,177	670	309	457	1,226	2,037	1	8,051	49,993	**137**
2047	25,608	6,905	5,239	678	313	463	1,241	2,066	1	8,161	50,674	**139**
2048	25,962	7,000	5,300	686	317	470	1,255	2,094	1	8,270	51,355	**141**
2049	26,315	7,096	5,361	694	320	476	1,270	2,123	1	8,380	52,036	**143**
2050	26,669	7,191	5,423	702	324	482	1,284	2,151	1	8,489	52,718	**144**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Irrigation	Other	New Commercial	Self Supplied	NRW	Total	AADD (MGD)
2015	2,472	454	709	1,814	110	29	0	524	1,094	7,206	**20**
2016	2,530	461	717	1,837	112	30	0	518	1,112	7,317	**20**
2017	2,587	469	723	1,851	113	30	0	513	1,128	7,414	**20**
2018	2,644	476	725	1,856	113	31	0	508	1,143	7,496	**21**
2019	2,703	484	728	1,864	113	31	0	503	1,156	7,583	**21**
2020	2,762	492	731	1,871	114	32	0	498	1,169	7,669	**21**
2021	2,822	500	734	1,881	114	32	0	493	1,182	7,759	**21**
2022	2,881	508	738	1,889	115	33	0	488	1,196	7,847	**21**
2023	2,940	516	742	1,901	116	33	0	483	1,209	7,941	**22**
2024	3,001	524	747	1,914	116	34	0	478	1,224	8,039	**22**
2025	3,062	532	752	1,927	117	34	0	474	1,239	8,137	**22**
2026	3,123	540	758	1,940	118	35	0	469	1,254	8,237	**23**
2027	3,184	548	763	1,955	119	35	0	464	1,269	8,338	**23**
2028	3,245	556	769	1,969	120	36	0	460	1,284	8,440	**23**
2029	3,306	565	775	1,983	121	36	0	455	1,300	8,541	**23**
2030	3,367	573	780	1,998	121	37	0	450	1,315	8,642	**24**
2031	3,429	581	786	2,013	122	37	0	446	1,330	8,746	**24**
2032	3,491	589	793	2,030	123	38	0	441	1,346	8,852	**24**
2033	3,553	598	800	2,047	125	38	0	437	1,362	8,960	**25**
2034	3,614	606	807	2,066	126	39	0	433	1,378	9,069	**25**
2035	3,676	614	814	2,085	127	39	0	428	1,395	9,179	**25**
2036	3,738	623	822	2,106	128	40	0	424	1,412	9,294	**25**
2037	3,801	631	831	2,127	129	40	0	420	1,429	9,409	**26**
2038	3,864	640	839	2,148	131	41	0	416	1,447	9,525	**26**
2039	3,926	648	848	2,171	132	42	0	411	1,465	9,642	**26**
2040	3,988	657	857	2,194	133	42	0	407	1,482	9,762	**27**
2041	4,052	665	867	2,220	135	43	0	403	1,501	9,887	**27**
2042	4,116	674	877	2,245	137	43	0	399	1,520	10,011	**27**
2043	4,180	683	887	2,272	138	44	0	395	1,539	10,138	**28**
2044	4,244	691	898	2,299	140	44	0	391	1,558	10,266	**28**
2045	4,308	700	909	2,327	142	45	0	387	1,577	10,395	**28**
2046	4,374	709	920	2,356	143	45	0	384	1,598	10,530	**29**
2047	4,441	718	932	2,386	145	46	0	380	1,618	10,666	**29**
2048	4,507	727	943	2,416	147	47	0	376	1,639	10,802	**30**
2049	4,573	736	955	2,446	149	47	0	372	1,660	10,939	**30**
2050	4,640	746	967	2,477	151	48	0	368	1,681	11,077	**30**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	4,088	787	600	140	9	200	205	293	1	2,100	8,423	**23**
2016	4,179	802	612	143	9	205	209	290	1	2,141	8,591	**24**
2017	4,271	818	621	145	9	208	213	287	1	2,183	8,755	**24**
2018	4,362	833	628	147	9	210	217	285	1	2,224	8,914	**24**
2019	4,459	849	635	148	9	212	221	282	1	2,266	9,082	**25**
2020	4,556	866	641	150	10	214	225	279	1	2,308	9,249	**25**
2021	4,654	882	647	151	10	216	229	276	1	2,350	9,416	**26**
2022	4,751	898	653	153	10	218	234	273	1	2,391	9,583	**26**
2023	4,848	915	659	154	10	220	238	271	1	2,433	9,748	**27**
2024	4,951	932	665	155	10	222	242	268	1	2,477	9,923	**27**
2025	5,053	949	672	157	11	225	247	265	1	2,520	10,099	**28**
2026	5,157	967	678	158	11	227	251	263	1	2,564	10,277	**28**
2027	5,260	984	685	160	11	229	256	260	1	2,609	10,455	**29**
2028	5,363	1,002	693	162	11	232	261	257	1	2,653	10,634	**29**
2029	5,467	1,019	701	164	11	234	265	255	1	2,698	10,814	**30**
2030	5,570	1,036	709	165	12	237	270	252	1	2,743	10,994	**30**
2031	5,675	1,054	717	167	12	240	274	250	1	2,789	11,179	**31**
2032	5,781	1,072	726	169	12	243	279	247	1	2,835	11,364	**31**
2033	5,886	1,090	735	172	12	246	284	245	1	2,881	11,551	**32**
2034	5,992	1,108	744	174	12	249	288	242	1	2,927	11,737	**32**
2035	6,097	1,126	754	176	13	252	293	240	1	2,974	11,925	**33**
2036	6,205	1,144	765	179	13	256	298	237	1	3,022	12,119	**33**
2037	6,313	1,162	775	181	13	259	302	235	1	3,070	12,313	**34**
2038	6,421	1,181	786	184	13	263	307	233	1	3,119	12,507	**34**
2039	6,529	1,199	797	186	13	266	312	230	1	3,167	12,702	**35**
2040	6,637	1,218	808	189	14	270	317	228	1	3,216	12,897	**35**
2041	6,750	1,237	821	192	14	274	322	226	1	3,267	13,102	**36**
2042	6,863	1,256	833	194	14	278	327	224	1	3,318	13,308	**36**
2043	6,976	1,275	845	197	14	283	332	221	1	3,369	13,513	**37**
2044	7,089	1,294	858	200	14	287	337	219	1	3,420	13,720	**38**
2045	7,201	1,314	871	203	15	291	342	217	1	3,472	13,926	**38**
2046	7,321	1,334	884	206	15	296	347	215	1	3,526	14,145	**39**
2047	7,441	1,354	898	210	15	300	352	213	1	3,581	14,365	**39**
2048	7,561	1,375	912	213	15	305	358	211	1	3,636	14,585	**40**
2049	7,680	1,395	925	216	16	309	363	208	1	3,691	14,805	**41**
2050	7,800	1,416	939	219	16	314	368	206	1	3,745	15,025	**41**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)									
	Single Family	Multifamily	Commercial	Municipal	Irrigation	New Commercial	Self Supplied	NRW	Total	AADD (MGD)
2015	2,527	228	376	213	32	1	83	1,087	4,547	**12**
2016	2,585	233	393	217	34	1	82	1,111	4,656	**13**
2017	2,644	238	406	222	35	1	81	1,137	4,764	**13**
2018	2,703	243	416	227	36	1	80	1,163	4,868	**13**
2019	2,765	248	425	232	37	1	80	1,189	4,977	**14**
2020	2,828	254	432	237	37	1	79	1,215	5,083	**14**
2021	2,891	259	439	242	38	1	78	1,241	5,188	**14**
2022	2,954	265	445	247	38	1	77	1,266	5,291	**14**
2023	3,016	270	450	252	39	1	77	1,290	5,394	**15**
2024	3,085	276	455	257	39	1	76	1,317	5,505	**15**
2025	3,153	282	460	263	40	1	75	1,344	5,617	**15**
2026	3,224	288	466	268	40	1	74	1,371	5,731	**16**
2027	3,294	294	472	274	41	1	74	1,399	5,846	**16**
2028	3,364	300	477	279	41	1	73	1,426	5,961	**16**
2029	3,435	306	483	285	41	1	72	1,453	6,075	**17**
2030	3,505	312	488	291	42	1	71	1,481	6,190	**17**
2031	3,580	318	495	296	42	1	71	1,510	6,312	**17**
2032	3,654	324	501	302	43	1	70	1,539	6,435	**18**
2033	3,729	331	507	308	44	1	69	1,568	6,557	**18**
2034	3,804	337	514	314	44	1	69	1,598	6,680	**18**
2035	3,878	343	521	320	45	1	68	1,627	6,803	**19**
2036	3,957	350	528	327	45	1	67	1,658	6,934	**19**
2037	4,036	357	536	333	46	1	66	1,689	7,064	**19**
2038	4,115	364	543	339	47	1	66	1,721	7,195	**20**
2039	4,194	370	550	346	47	1	65	1,752	7,325	**20**
2040	4,273	377	558	352	48	1	65	1,783	7,456	**20**
2041	4,357	384	565	359	49	1	64	1,816	7,595	**21**
2042	4,441	392	573	365	49	1	63	1,849	7,734	**21**
2043	4,526	399	581	372	50	1	63	1,883	7,874	**22**
2044	4,610	406	589	379	51	1	62	1,916	8,013	**22**
2045	4,694	413	597	385	51	1	61	1,949	8,153	**22**
2046	4,785	421	606	393	52	1	61	1,986	8,305	**23**
2047	4,877	429	615	400	53	1	60	2,022	8,456	**23**
2048	4,968	437	624	407	54	1	60	2,058	8,608	**24**
2049	5,059	445	633	415	54	1	59	2,094	8,759	**24**
2050	5,150	452	642	422	55	1	58	2,131	8,911	**24**

	PROJECTED BASELINE WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family Residential	Multi Family Residential	Commercial	Institutional	Industrial	Irrigation	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	1,854	209	485	56	84	52	345	229	1	1,366	4,681	13
2016	1,884	212	501	57	86	53	349	227	1	1,385	4,755	13
2017	1,914	215	513	58	88	55	354	225	1	1,406	4,829	13
2018	1,944	217	522	58	90	56	359	223	1	1,428	4,897	13
2019	1,974	220	529	59	91	56	363	220	1	1,448	4,963	14
2020	2,005	223	535	60	92	57	368	218	1	1,467	5,026	14
2021	2,035	226	540	61	93	58	373	216	1	1,486	5,088	14
2022	2,065	229	545	62	94	58	377	214	1	1,504	5,148	14
2023	2,096	232	549	62	95	59	382	212	1	1,521	5,208	14
2024	2,125	234	553	63	95	59	387	210	1	1,538	5,265	14
2025	2,155	237	558	64	96	59	391	208	1	1,555	5,323	15
2026	2,183	240	561	64	97	60	395	205	1	1,571	5,378	15
2027	2,212	242	565	65	97	60	400	203	1	1,587	5,434	15
2028	2,240	245	569	66	98	61	404	201	1	1,604	5,489	15
2029	2,269	248	573	67	99	61	409	199	1	1,620	5,545	15
2030	2,297	250	577	67	99	61	413	197	1	1,636	5,600	15
2031	2,323	253	580	68	100	62	417	195	1	1,651	5,650	15
2032	2,350	255	584	69	101	62	421	193	1	1,665	5,700	16
2033	2,376	258	587	69	101	63	425	191	1	1,680	5,750	16
2034	2,402	260	591	70	102	63	429	190	1	1,694	5,801	16
2035	2,428	263	594	71	102	63	433	188	1	1,709	5,851	16
2036	2,452	265	598	71	103	64	437	186	1	1,723	5,898	16
2037	2,476	267	601	72	104	64	440	184	1	1,736	5,945	16
2038	2,500	269	604	72	104	64	444	182	1	1,750	5,991	16
2039	2,524	271	608	73	105	65	448	180	1	1,763	6,038	17
2040	2,548	274	611	74	105	65	451	178	1	1,777	6,085	17
2041	2,571	276	615	74	106	66	455	177	1	1,790	6,130	17
2042	2,594	278	618	75	107	66	458	175	1	1,803	6,175	17
2043	2,617	280	622	75	107	66	462	173	1	1,816	6,220	17
2044	2,640	282	625	76	108	67	466	171	1	1,830	6,266	17
2045	2,663	284	629	76	108	67	469	170	1	1,843	6,311	17
2046	2,687	287	633	77	109	67	473	168	1	1,856	6,357	17
2047	2,710	289	636	78	110	68	476	166	1	1,870	6,403	18
2048	2,733	291	639	78	110	68	480	165	1	1,883	6,448	18
2049	2,756	293	643	79	111	68	483	163	1	1,896	6,494	18
2050	2,780	295	646	79	111	69	487	161	1	1,910	6,540	18

Attachment 8

Bartow Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multi Family	Commercial	Industrial	Irrigation	Agricultural	Self Supplied	New Commercial	Anheuser-Busch	NRW	Total	AADD (MGD)
2015	2,003	222	392	2,103	23	17	207	4	1,826	2,991	9,787	27
2016	2,082	230	402	2,165	23	17	206	175	1,826	3,108	10,234	28
2017	2,157	237	410	2,214	24	17	205	311	1,826	3,240	10,641	29
2018	2,227	243	416	2,249	24	17	204	409	1,826	3,358	10,973	30
2019	2,292	249	421	2,280	25	17	203	498	1,826	3,454	11,264	31
2020	2,352	255	425	2,309	25	17	202	579	1,826	3,537	11,526	32
2021	2,409	260	429	2,337	25	17	201	658	1,826	3,612	11,775	32
2022	2,462	265	433	2,363	26	17	200	731	1,826	3,683	12,005	33
2023	2,512	270	438	2,390	26	17	199	808	1,826	3,751	12,235	34
2024	2,560	274	442	2,416	26	17	198	881	1,826	3,818	12,458	34
2025	2,605	278	445	2,442	26	17	197	953	1,826	3,884	12,674	35
2026	2,649	282	449	2,467	27	17	196	1,025	1,826	3,948	12,887	35
2027	2,691	286	454	2,494	27	17	195	1,101	1,826	4,012	13,102	36
2028	2,732	290	458	2,522	27	17	194	1,177	1,826	4,076	13,318	36
2029	2,771	293	462	2,548	28	17	193	1,251	1,826	4,140	13,528	37
2030	2,808	296	466	2,574	28	17	192	1,324	1,826	4,203	13,734	38
2031	2,841	299	470	2,599	28	17	191	1,396	1,826	4,262	13,929	38
2032	2,873	302	474	2,625	28	17	190	1,469	1,826	4,317	14,121	39
2033	2,903	305	478	2,650	29	17	189	1,539	1,826	4,372	14,307	39
2034	2,930	307	482	2,674	29	17	188	1,607	1,826	4,424	14,484	40
2035	2,956	309	485	2,697	29	17	187	1,672	1,826	4,475	14,654	40
2036	2,981	311	489	2,721	30	17	186	1,739	1,826	4,524	14,824	41
2037	3,003	313	492	2,744	30	17	185	1,803	1,826	4,573	14,987	41
2038	3,025	315	496	2,767	30	17	184	1,867	1,826	4,620	15,147	41
2039	3,044	317	499	2,788	30	17	183	1,926	1,826	4,667	15,297	42
2040	3,063	319	503	2,811	31	17	182	1,992	1,826	4,711	15,454	42
2041	3,081	320	506	2,833	31	17	182	2,055	1,826	4,757	15,607	43
2042	3,097	321	509	2,855	31	17	181	2,115	1,826	4,802	15,755	43
2043	3,113	323	513	2,877	31	17	180	2,177	1,826	4,845	15,901	44
2044	3,127	324	516	2,899	31	17	179	2,240	1,826	4,888	16,048	44
2045	3,141	325	519	2,921	32	17	178	2,302	1,826	4,932	16,192	44
2046	3,154	326	523	2,942	32	17	177	2,360	1,826	4,975	16,331	45
2047	3,166	327	526	2,963	32	17	176	2,420	1,826	5,017	16,470	45
2048	3,178	328	529	2,982	32	17	175	2,475	1,826	5,059	16,601	45
2049	3,190	329	532	3,002	33	17	174	2,532	1,826	5,099	16,734	46
2050	3,202	330	535	3,023	33	17	174	2,589	1,826	5,140	16,868	46

Cherokee Enhanced Efficiency, Scenario 1

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)												
	Single Family	Multifamily	Commercial	Institutional	Industrial	Irrigation	Agricultural	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	3,950	563	245	50	223	250	99	152	365	1	1,184	7,081	**19**
2016	4,065	576	253	51	232	260	99	156	362	1	1,219	7,275	**20**
2017	4,180	590	259	53	239	268	99	161	359	1	1,252	7,461	**20**
2018	4,294	603	264	54	245	275	99	165	357	1	1,283	7,639	**21**
2019	4,404	616	268	56	250	280	99	170	354	1	1,312	7,809	**21**
2020	4,511	629	271	57	254	285	99	174	351	1	1,339	7,972	**22**
2021	4,614	641	274	59	258	290	99	179	348	1	1,365	8,127	**22**
2022	4,713	652	277	60	262	294	99	183	345	1	1,390	8,275	**23**
2023	4,808	663	279	61	265	297	99	187	342	1	1,415	8,418	**23**
2024	4,902	673	282	63	268	301	99	191	339	1	1,438	8,557	**23**
2025	4,994	683	284	64	271	305	99	195	336	1	1,461	8,694	**24**
2026	5,084	693	287	65	275	308	99	199	333	1	1,484	8,829	**24**
2027	5,174	703	290	67	278	313	99	203	330	1	1,507	8,965	**25**
2028	5,264	713	293	68	282	317	99	208	327	1	1,529	9,101	**25**
2029	5,354	722	296	69	286	321	99	212	324	1	1,552	9,235	**25**
2030	5,443	732	299	71	290	325	99	216	321	1	1,575	9,371	**26**
2031	5,528	741	302	72	293	329	99	220	318	1	1,596	9,499	**26**
2032	5,612	750	305	74	297	334	99	224	315	1	1,617	9,627	**26**
2033	5,695	758	308	75	301	338	99	228	312	1	1,637	9,752	**27**
2034	5,776	767	311	76	305	342	99	232	309	1	1,658	9,876	**27**
2035	5,857	776	314	77	309	346	99	236	306	1	1,678	9,999	**27**
2036	5,937	785	317	79	313	351	99	240	304	1	1,698	10,121	**28**
2037	6,015	793	320	80	316	355	99	243	301	1	1,718	10,242	**28**
2038	6,092	802	323	81	320	359	99	247	299	1	1,737	10,360	**28**
2039	6,167	810	326	82	324	364	99	250	296	1	1,756	10,476	**29**
2040	6,241	818	329	83	328	368	99	254	294	1	1,775	10,590	**29**
2041	6,312	826	329	84	329	369	99	257	292	1	1,793	10,691	**29**
2042	6,381	833	330	85	330	371	99	260	290	1	1,809	10,790	**30**
2043	6,446	840	332	86	332	373	99	263	287	1	1,825	10,884	**30**
2044	6,507	847	333	87	334	375	99	266	285	1	1,839	10,975	**30**
2045	6,565	853	334	88	336	377	99	269	283	1	1,854	11,060	**30**
2046	6,620	859	335	89	338	379	99	272	281	1	1,867	11,139	**31**
2047	6,672	864	336	90	339	381	99	274	279	1	1,879	11,214	**31**
2048	6,720	869	336	91	340	382	99	277	277	1	1,891	11,282	**31**
2049	6,765	874	336	91	341	382	99	279	275	1	1,901	11,345	**31**
2050	6,807	878	336	92	341	383	99	281	273	1	1,911	11,402	**31**

Clayton Enhanced Efficiency, Scenario 1

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Agricultural	Other	New Commercia	NRW	Total	AADD (MGD)
2015	3,948	1,821	999	413	836	0	19	1	869	8,907	**24**
2016	3,964	1,828	996	424	843	0	20	150	875	9,099	**25**
2017	3,983	1,836	993	432	850	0	20	269	895	9,278	**25**
2018	4,004	1,845	990	438	857	0	21	352	913	9,420	**26**
2019	4,025	1,854	987	443	865	0	21	426	927	9,549	**26**
2020	4,045	1,862	984	448	873	0	21	488	940	9,662	**26**
2021	4,064	1,870	982	452	881	0	21	548	951	9,768	**27**
2022	4,079	1,876	979	456	888	0	21	600	961	9,860	**27**
2023	4,090	1,880	976	458	894	0	21	639	969	9,930	**27**
2024	4,098	1,883	974	461	900	0	22	678	975	9,991	**27**
2025	4,105	1,886	971	464	906	0	22	719	981	10,053	**28**
2026	4,110	1,887	969	467	911	0	22	758	987	10,111	**28**
2027	4,115	1,889	967	470	917	0	22	801	993	10,173	**28**
2028	4,120	1,891	964	473	923	0	22	847	999	10,239	**28**
2029	4,126	1,893	962	477	930	0	22	894	1,006	10,310	**28**
2030	4,134	1,895	960	480	936	0	22	942	1,013	10,383	**28**
2031	4,140	1,897	958	483	943	0	23	990	1,020	10,454	**29**
2032	4,148	1,900	956	487	950	0	23	1,040	1,027	10,531	**29**
2033	4,157	1,904	953	491	957	0	23	1,092	1,035	10,612	**29**
2034	4,168	1,909	951	494	964	0	23	1,143	1,043	10,694	**29**
2035	4,181	1,914	949	498	971	0	23	1,194	1,051	10,781	**30**
2036	4,195	1,919	947	501	978	0	23	1,245	1,059	10,869	**30**
2037	4,210	1,926	945	505	985	0	24	1,295	1,068	10,957	**30**
2038	4,225	1,932	943	508	992	0	24	1,344	1,077	11,046	**30**
2039	4,242	1,939	941	512	999	0	24	1,393	1,085	11,136	**31**
2040	4,259	1,946	939	516	1,007	0	24	1,447	1,094	11,233	**31**
2041	4,277	1,954	937	519	1,014	0	24	1,499	1,104	11,329	**31**
2042	4,295	1,962	935	523	1,022	0	25	1,549	1,113	11,423	**31**
2043	4,313	1,969	933	527	1,029	0	25	1,601	1,122	11,520	**32**
2044	4,331	1,977	931	530	1,036	0	25	1,653	1,132	11,615	**32**
2045	4,349	1,985	929	534	1,043	0	25	1,707	1,141	11,714	**32**
2046	4,367	1,992	927	538	1,050	0	25	1,758	1,150	11,808	**32**
2047	4,384	1,999	925	542	1,058	0	25	1,811	1,160	11,904	**33**
2048	4,401	2,006	923	545	1,065	0	26	1,862	1,169	11,997	**33**
2049	4,418	2,014	922	549	1,072	0	26	1,913	1,178	12,090	**33**
2050	4,435	2,021	920	552	1,078	0	26	1,964	1,187	12,184	**33**

Cobb Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercia	NRW	Total	AADD (MGD)
2015	12,497	3,621	5,223	682	392	0	779	1	1	2,190	25,385	**70**
2016	12,490	3,617	5,356	684	403	0	803	1	1	2,195	25,548	**70**
2017	12,503	3,619	5,460	686	413	0	821	1	1	2,213	25,718	**70**
2018	12,530	3,625	5,535	690	420	0	835	1	1	2,231	25,868	**71**
2019	12,565	3,634	5,601	694	426	0	847	1	1	2,246	26,015	**71**
2020	12,606	3,643	5,655	699	431	0	858	1	1	2,260	26,154	**72**
2021	12,649	3,654	5,706	704	436	0	868	1	1	2,273	26,290	**72**
2022	12,691	3,664	5,747	710	440	0	876	1	1	2,285	26,414	**72**
2023	12,739	3,675	5,791	715	445	0	885	1	1	2,297	26,547	**73**
2024	12,793	3,688	5,836	722	449	0	893	1	1	2,310	26,692	**73**
2025	12,853	3,703	5,883	728	454	0	902	1	1	2,324	26,849	**74**
2026	12,918	3,719	5,928	736	458	0	911	1	1	2,339	27,010	**74**
2027	12,989	3,736	5,974	743	462	0	920	1	1	2,355	27,181	**74**
2028	13,066	3,755	6,026	752	467	0	930	1	1	2,371	27,368	**75**
2029	13,148	3,775	6,076	760	472	0	939	1	1	2,389	27,562	**76**
2030	13,235	3,797	6,125	770	477	0	949	1	1	2,407	27,760	**76**
2031	13,317	3,817	6,176	779	482	0	958	1	1	2,423	27,954	**77**
2032	13,403	3,839	6,226	788	486	0	968	1	1	2,439	28,151	**77**
2033	13,493	3,862	6,278	797	491	0	977	1	1	2,457	28,357	**78**
2034	13,587	3,886	6,330	806	496	0	987	1	1	2,474	28,568	**78**
2035	13,685	3,911	6,384	815	501	0	997	1	1	2,493	28,787	**79**
2036	13,784	3,937	6,437	824	506	0	1,007	1	1	2,511	29,009	**79**
2037	13,886	3,964	6,491	833	511	0	1,017	1	1	2,530	29,234	**80**
2038	13,987	3,991	6,543	842	516	0	1,027	1	1	2,549	29,458	**81**
2039	14,089	4,018	6,594	851	521	0	1,037	1	1	2,568	29,679	**81**
2040	14,191	4,045	6,648	860	526	0	1,047	1	1	2,587	29,905	**82**
2041	14,290	4,071	6,699	869	531	0	1,057	1	1	2,606	30,125	**83**
2042	14,387	4,097	6,751	877	536	0	1,066	1	1	2,624	30,340	**83**
2043	14,479	4,122	6,802	885	541	0	1,076	1	1	2,642	30,548	**84**
2044	14,567	4,145	6,853	893	545	0	1,085	1	1	2,659	30,749	**84**
2045	14,651	4,167	6,902	901	550	0	1,095	1	1	2,675	30,943	**85**
2046	14,730	4,188	6,952	908	555	0	1,104	1	1	2,691	31,129	**85**
2047	14,804	4,208	7,000	915	560	0	1,114	1	1	2,706	31,308	**86**
2048	14,873	4,226	7,047	921	564	0	1,122	1	1	2,721	31,476	**86**
2049	14,938	4,243	7,093	928	569	0	1,131	1	1	2,734	31,637	**87**
2050	14,998	4,258	7,139	934	573	0	1,140	1	1	2,747	31,791	**87**

Coweta Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	ew Commerci	Self-Supplied	NRW	Total	AADD (MGD)
2015	2,234	320	496	66	305	370	181	0	405	483	4,860	**13**
2016	2,319	329	511	69	315	383	188	0	400	500	5,014	**14**
2017	2,403	338	523	71	324	395	193	0	395	515	5,157	**14**
2018	2,483	347	532	73	330	408	196	0	390	529	5,289	**14**
2019	2,560	355	540	75	336	419	200	0	386	541	5,414	**15**
2020	2,634	363	548	77	341	431	203	0	381	553	5,532	**15**
2021	2,704	371	555	79	346	442	206	0	376	564	5,644	**15**
2022	2,771	378	561	81	351	453	209	0	371	575	5,751	**16**
2023	2,836	385	567	83	355	464	211	0	366	585	5,852	**16**
2024	2,897	391	572	85	359	474	214	0	361	595	5,948	**16**
2025	2,956	397	577	87	363	484	216	0	357	604	6,042	**17**
2026	3,014	403	583	89	367	494	218	0	352	613	6,132	**17**
2027	3,070	409	589	91	371	504	221	0	347	622	6,222	**17**
2028	3,124	415	594	92	375	514	223	0	342	631	6,311	**17**
2029	3,178	420	600	94	379	524	226	0	337	640	6,398	**18**
2030	3,231	426	606	96	384	534	228	0	332	648	6,485	**18**
2031	3,280	431	612	98	388	543	231	0	328	656	6,566	**18**
2032	3,328	435	619	99	392	552	233	0	323	664	6,646	**18**
2033	3,374	440	625	101	397	561	236	0	319	671	6,724	**18**
2034	3,420	445	630	102	401	570	239	0	314	679	6,799	**19**
2035	3,463	449	636	104	405	578	241	0	310	686	6,872	**19**
2036	3,506	454	642	105	409	586	243	0	306	693	6,943	**19**
2037	3,547	458	647	107	413	593	246	0	302	699	7,012	**19**
2038	3,587	462	653	108	417	600	248	0	298	706	7,079	**19**
2039	3,625	466	658	109	421	607	250	0	295	712	7,143	**20**
2040	3,662	469	663	110	425	614	253	0	291	718	7,205	**20**
2041	3,697	473	669	112	428	621	255	0	287	724	7,266	**20**
2042	3,730	476	674	113	432	627	257	0	284	730	7,323	**20**
2043	3,762	479	679	114	436	633	259	0	280	735	7,377	**20**
2044	3,792	482	684	115	440	638	262	0	277	740	7,430	**20**
2045	3,820	485	689	116	443	644	264	0	273	745	7,479	**20**
2046	3,847	488	694	117	447	649	266	0	270	750	7,526	**21**
2047	3,873	490	699	117	450	654	268	0	267	754	7,572	**21**
2048	3,897	492	703	118	454	658	270	0	264	758	7,615	**21**
2049	3,920	494	708	119	457	663	272	0	260	763	7,658	**21**
2050	3,943	496	713	120	461	667	274	0	257	767	7,698	**21**

DeKalb Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Residential	ot/Condo (MF	Commercial	stitutional (SC	unicipal (GO	Other	Irrigation	ew Commerci	NRW	Total	AAD (MGD)
2015	10,756	3,847	4,889	227	137	26	645	1	5,441	25,969	71
2016	10,743	3,838	4,991	228	137	26	662	1	5,450	26,077	71
2017	10,743	3,834	5,071	229	137	27	675	1	5,482	26,198	72
2018	10,752	3,833	5,124	230	138	27	684	1	5,513	26,300	72
2019	10,766	3,833	5,171	231	139	27	692	1	5,538	26,397	72
2020	10,784	3,835	5,212	232	139	27	699	1	5,562	26,491	73
2021	10,805	3,837	5,253	233	140	27	706	1	5,584	26,588	73
2022	10,829	3,840	5,291	235	141	27	713	1	5,607	26,684	73
2023	10,855	3,844	5,327	237	142	28	719	1	5,630	26,783	73
2024	10,885	3,848	5,362	238	143	28	726	1	5,654	26,886	74
2025	10,920	3,854	5,398	240	145	28	732	1	5,679	26,998	74
2026	10,958	3,861	5,433	243	146	28	738	1	5,706	27,113	74
2027	11,000	3,869	5,469	245	147	28	744	1	5,733	27,236	75
2028	11,046	3,878	5,508	247	149	29	751	1	5,762	27,370	75
2029	11,095	3,888	5,546	250	150	29	758	1	5,793	27,509	75
2030	11,148	3,899	5,583	252	152	29	764	1	5,825	27,652	76
2031	11,196	3,908	5,620	255	153	30	771	1	5,852	27,786	76
2032	11,246	3,918	5,657	258	155	30	777	1	5,879	27,921	76
2033	11,300	3,930	5,697	260	156	30	784	1	5,907	28,065	77
2034	11,357	3,943	5,737	263	158	31	791	1	5,938	28,217	77
2035	11,417	3,958	5,778	265	159	31	798	1	5,970	28,377	78
2036	11,480	3,973	5,820	268	161	31	805	1	6,003	28,542	78
2037	11,545	3,990	5,861	270	163	31	812	1	6,037	28,710	79
2038	11,611	4,008	5,902	273	164	32	819	1	6,073	28,882	79
2039	11,679	4,026	5,940	276	166	32	825	1	6,108	29,052	80
2040	11,749	4,045	5,984	278	167	32	833	1	6,144	29,234	80
2041	11,820	4,065	6,026	281	169	33	840	1	6,182	29,415	81
2042	11,890	4,084	6,068	283	170	33	847	1	6,219	29,596	81
2043	11,958	4,103	6,111	286	172	33	854	1	6,256	29,775	82
2044	12,026	4,121	6,155	288	173	34	862	1	6,292	29,952	82
2045	12,091	4,139	6,199	291	175	34	869	1	6,328	30,127	83
2046	12,155	4,157	6,243	293	176	34	876	1	6,364	30,300	83
2047	12,217	4,173	6,287	296	178	34	884	1	6,399	30,468	83
2048	12,276	4,189	6,330	298	179	35	891	1	6,433	30,631	84
2049	12,332	4,204	6,373	300	180	35	898	1	6,465	30,789	84
2050	12,386	4,218	6,416	302	182	35	906	1	6,497	30,941	85

Douglas Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercia	NRW	Total	AADD (MGD)
2015	2,284	546	375	78	114	186	86	0	899	4,567	**13**
2016	2,311	552	385	79	118	189	89	0	913	4,635	**13**
2017	2,339	558	394	80	121	192	92	0	927	4,704	**13**
2018	2,368	564	401	82	124	195	94	0	941	4,769	**13**
2019	2,398	571	407	83	126	198	96	0	954	4,833	**13**
2020	2,427	577	413	84	129	201	97	0	967	4,896	**13**
2021	2,457	584	418	86	131	205	99	0	980	4,957	**14**
2022	2,486	590	422	87	132	208	100	0	992	5,017	**14**
2023	2,514	596	426	88	134	211	101	0	1,004	5,076	**14**
2024	2,543	602	430	90	136	215	103	0	1,015	5,133	**14**
2025	2,571	608	434	91	138	218	104	0	1,027	5,192	**14**
2026	2,600	614	438	93	139	222	105	0	1,039	5,249	**14**
2027	2,629	620	442	94	141	225	107	0	1,050	5,308	**15**
2028	2,658	626	446	96	143	229	108	0	1,062	5,369	**15**
2029	2,688	632	451	98	145	233	109	0	1,074	5,430	**15**
2030	2,718	638	455	99	147	237	111	0	1,087	5,491	**15**
2031	2,746	644	460	101	148	241	112	0	1,098	5,550	**15**
2032	2,774	649	464	102	150	245	113	0	1,109	5,608	**15**
2033	2,802	655	468	104	152	248	115	0	1,120	5,665	**16**
2034	2,830	661	473	105	154	252	116	0	1,131	5,723	**16**
2035	2,858	667	477	107	156	255	118	0	1,142	5,780	**16**
2036	2,886	673	482	108	158	259	119	0	1,153	5,838	**16**
2037	2,914	678	486	110	159	262	120	0	1,164	5,895	**16**
2038	2,941	684	491	111	161	266	122	0	1,175	5,951	**16**
2039	2,968	690	495	113	163	269	123	0	1,186	6,005	**16**
2040	2,994	695	499	114	165	272	124	0	1,196	6,060	**17**
2041	3,019	701	503	115	166	275	126	0	1,206	6,112	**17**
2042	3,044	706	507	116	168	278	127	0	1,216	6,162	**17**
2043	3,067	711	511	118	170	281	128	0	1,226	6,211	**17**
2044	3,089	715	515	119	171	284	129	0	1,235	6,257	**17**
2045	3,110	720	518	120	173	287	131	0	1,243	6,302	**17**
2046	3,130	724	522	121	174	289	132	0	1,251	6,344	**17**
2047	3,149	728	525	122	176	292	133	0	1,259	6,384	**17**
2048	3,166	731	528	123	177	294	134	0	1,267	6,421	**18**
2049	3,182	735	531	124	179	296	135	0	1,274	6,456	**18**
2050	3,198	738	534	125	180	298	136	0	1,280	6,489	**18**

Fayette Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AAD (MGD)
2015	2,416	157	444	56	29	82	195	478	333	4,189	11
2016	2,420	156	455	58	29	84	195	473	333	4,203	12
2017	2,431	156	464	59	29	86	196	467	335	4,224	12
2018	2,447	157	470	60	30	88	197	462	337	4,247	12
2019	2,467	157	476	61	30	89	198	456	340	4,275	12
2020	2,490	158	481	62	30	90	200	451	342	4,305	12
2021	2,515	159	486	63	30	92	202	445	345	4,337	12
2022	2,543	160	490	63	31	93	204	440	348	4,372	12
2023	2,572	161	494	64	31	94	206	434	351	4,407	12
2024	2,604	162	497	65	31	94	209	429	354	4,445	12
2025	2,637	164	500	65	32	95	212	423	357	4,485	12
2026	2,672	165	503	66	32	96	214	418	361	4,527	12
2027	2,709	166	507	66	33	97	217	412	365	4,572	13
2028	2,748	168	511	67	33	98	221	407	368	4,621	13
2029	2,790	170	515	68	34	99	224	401	373	4,674	13
2030	2,833	171	519	69	34	100	228	396	377	4,727	13
2031	2,875	173	523	69	35	101	231	390	381	4,779	13
2032	2,916	175	527	70	35	102	235	385	385	4,829	13
2033	2,956	176	530	71	36	103	238	380	389	4,879	13
2034	2,995	178	534	71	36	104	241	375	393	4,928	14
2035	3,032	179	538	72	37	105	244	371	396	4,974	14
2036	3,068	181	542	72	37	106	247	366	400	5,019	14
2037	3,103	182	546	73	38	107	250	361	403	5,062	14
2038	3,135	184	549	74	38	108	253	357	406	5,103	14
2039	3,166	185	553	74	38	109	255	353	409	5,142	14
2040	3,195	186	557	75	39	110	257	348	412	5,178	14
2041	3,222	187	560	76	39	110	260	344	415	5,213	14
2042	3,246	188	564	76	39	111	262	340	417	5,244	14
2043	3,268	189	568	77	40	112	263	336	419	5,272	14
2044	3,287	189	571	78	40	113	265	332	421	5,297	15
2045	3,305	190	575	78	40	114	266	328	423	5,319	15
2046	3,320	190	578	79	40	115	268	324	424	5,339	15
2047	3,334	191	582	79	40	116	269	321	426	5,357	15
2048	3,346	191	585	80	41	117	270	317	427	5,373	15
2049	3,358	191	588	81	41	118	271	313	428	5,388	15
2050	3,368	192	591	81	41	118	272	310	429	5,402	15

Forsyth Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Residential	Commercial	Industrial	Municipal	Irrigation	Other	ew Commerci	Self Supplied	NRW	Total	AADD (MGD)
2015	4,313	910	456	61	253	36	1	194	1,839	8,063	22
2016	4,494	942	474	64	263	38	1	192	1,922	8,388	23
2017	4,676	969	488	67	271	40	1	190	1,997	8,698	24
2018	4,862	988	499	70	277	41	1	188	2,069	8,995	25
2019	5,049	1,007	510	72	283	43	1	186	2,138	9,289	25
2020	5,236	1,024	520	75	288	45	1	184	2,205	9,578	26
2021	5,423	1,041	529	78	293	47	1	182	2,270	9,864	27
2022	5,607	1,057	538	81	299	48	1	180	2,335	10,146	28
2023	5,790	1,073	547	84	303	50	1	179	2,399	10,426	29
2024	5,972	1,088	556	87	308	52	1	177	2,462	10,703	29
2025	6,152	1,104	565	90	313	54	1	175	2,525	10,978	30
2026	6,330	1,119	574	93	318	55	1	173	2,587	11,251	31
2027	6,507	1,135	583	96	323	57	1	172	2,649	11,522	32
2028	6,681	1,151	592	99	328	59	1	170	2,710	11,791	32
2029	6,853	1,168	602	102	334	61	1	168	2,771	12,060	33
2030	7,023	1,185	611	105	339	63	1	166	2,831	12,323	34
2031	7,181	1,202	620	108	344	64	1	165	2,887	12,571	34
2032	7,331	1,218	630	111	349	66	1	163	2,939	12,807	35
2033	7,473	1,234	639	113	354	67	1	161	2,988	13,031	36
2034	7,606	1,250	648	116	359	69	1	160	3,035	13,244	36
2035	7,732	1,266	657	118	364	70	1	158	3,080	13,446	37
2036	7,851	1,282	666	120	369	71	1	157	3,123	13,640	37
2037	7,964	1,298	675	122	374	73	1	155	3,164	13,825	38
2038	8,071	1,313	684	124	379	74	1	154	3,203	14,002	38
2039	8,172	1,329	693	126	384	75	1	152	3,241	14,172	39
2040	8,268	1,345	702	127	389	76	1	151	3,277	14,335	39
2041	8,357	1,362	711	129	394	77	1	149	3,312	14,492	40
2042	8,439	1,378	721	130	400	78	1	148	3,344	14,639	40
2043	8,513	1,395	730	132	405	78	1	146	3,375	14,776	40
2044	8,580	1,412	740	133	410	79	1	145	3,403	14,904	41
2045	8,638	1,430	750	134	416	80	1	143	3,429	15,021	41
2046	8,689	1,448	761	135	422	81	1	142	3,453	15,130	41
2047	8,732	1,468	772	136	428	81	1	140	3,475	15,234	42
2048	8,769	1,490	784	137	435	82	1	139	3,495	15,332	42
2049	8,798	1,516	799	138	443	82	1	137	3,515	15,429	42
2050	8,820	1,547	816	138	453	82	1	136	3,534	15,528	43

Fulton Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AADD (MGD)
2015	14,658	8,405	13,027	233	621	783	53	173	234	12,600	50,787	**139**
2016	14,744	8,448	13,302	236	636	790	55	174	231	12,711	51,327	**141**
2017	14,831	8,492	13,505	238	647	797	56	176	229	12,850	51,821	**142**
2018	14,915	8,534	13,635	240	655	804	56	178	227	12,972	52,215	**143**
2019	14,993	8,573	13,743	242	661	811	57	179	224	13,067	52,552	**144**
2020	15,065	8,608	13,829	244	667	818	57	181	222	13,147	52,838	**145**
2021	15,131	8,640	13,913	246	672	825	58	182	220	13,214	53,100	**145**
2022	15,190	8,667	13,985	248	676	831	58	183	218	13,276	53,333	**146**
2023	15,248	8,694	14,067	250	682	838	59	185	216	13,336	53,574	**147**
2024	15,307	8,722	14,155	252	687	844	59	186	213	13,401	53,827	**147**
2025	15,368	8,751	14,243	254	692	852	60	188	211	13,468	54,086	**148**
2026	15,429	8,779	14,321	256	697	859	60	190	209	13,534	54,334	**149**
2027	15,490	8,808	14,402	258	702	867	60	191	207	13,599	54,584	**150**
2028	15,553	8,838	14,496	261	708	874	61	193	205	13,665	54,853	**150**
2029	15,616	8,867	14,582	263	713	882	61	195	203	13,734	55,117	**151**
2030	15,679	8,897	14,659	266	718	891	62	197	201	13,800	55,368	**152**
2031	15,733	8,921	14,742	268	723	898	62	198	199	13,856	55,600	**152**
2032	15,787	8,946	14,818	270	727	906	63	200	197	13,908	55,822	**153**
2033	15,845	8,972	14,906	272	732	913	63	202	195	13,962	56,063	**154**
2034	15,904	9,001	14,995	275	738	920	63	203	193	14,019	56,311	**154**
2035	15,967	9,030	15,085	277	743	928	64	205	191	14,079	56,569	**155**
2036	16,030	9,061	15,176	279	748	935	64	206	189	14,142	56,832	**156**
2037	16,096	9,093	15,267	281	754	942	65	208	187	14,205	57,098	**156**
2038	16,163	9,126	15,357	283	759	949	65	209	185	14,270	57,367	**157**
2039	16,230	9,159	15,443	285	764	956	66	211	183	14,335	57,631	**158**
2040	16,299	9,193	15,543	287	770	962	66	212	182	14,400	57,914	**159**
2041	16,367	9,226	15,636	289	776	969	67	214	180	14,467	58,191	**159**
2042	16,433	9,259	15,730	291	781	975	67	215	178	14,534	58,464	**160**
2043	16,496	9,290	15,823	293	787	982	68	217	176	14,598	58,730	**161**
2044	16,557	9,320	15,918	295	792	988	68	218	175	14,661	58,991	**162**
2045	16,616	9,348	16,012	296	798	994	69	219	173	14,723	59,247	**162**
2046	16,671	9,374	16,107	298	804	999	69	221	171	14,783	59,497	**163**
2047	16,723	9,399	16,202	300	809	1,005	70	222	169	14,842	59,741	**164**
2048	16,772	9,422	16,295	301	815	1,010	70	223	168	14,900	59,976	**164**
2049	16,818	9,444	16,390	303	820	1,015	71	224	166	14,955	60,205	**165**
2050	16,860	9,463	16,485	304	826	1,020	71	225	164	15,008	60,427	**166**

Gwinnett Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	ew Commerc	NRW	Total	AADD (MGD)
2015	15,093	4,070	3,196	414	191	273	757	1,218	1	4,837	30,050	**82**
2016	15,227	4,105	3,289	428	197	276	782	1,232	1	4,896	30,434	**83**
2017	15,372	4,144	3,366	439	203	280	804	1,248	1	4,963	30,819	**84**
2018	15,521	4,183	3,423	448	207	284	820	1,265	1	5,028	31,179	**85**
2019	15,672	4,223	3,475	456	211	288	835	1,282	1	5,087	31,529	**86**
2020	15,824	4,264	3,519	463	214	291	847	1,300	1	5,145	31,868	**87**
2021	15,975	4,304	3,561	470	217	295	860	1,318	1	5,200	32,200	**88**
2022	16,125	4,343	3,597	476	220	299	870	1,335	1	5,254	32,520	**89**
2023	16,277	4,383	3,632	481	222	304	881	1,354	1	5,308	32,842	**90**
2024	16,432	4,424	3,666	487	225	308	891	1,373	1	5,362	33,169	**91**
2025	16,592	4,466	3,702	493	227	312	901	1,393	1	5,418	33,506	**92**
2026	16,754	4,508	3,737	498	230	317	911	1,414	1	5,474	33,845	**93**
2027	16,921	4,552	3,772	504	233	322	922	1,436	1	5,531	34,191	**94**
2028	17,092	4,597	3,810	510	235	327	933	1,458	1	5,589	34,551	**95**
2029	17,269	4,643	3,847	516	238	332	943	1,481	1	5,650	34,920	**96**
2030	17,450	4,690	3,883	521	241	337	954	1,505	1	5,712	35,293	**97**
2031	17,624	4,735	3,920	527	243	343	965	1,528	1	5,770	35,656	**98**
2032	17,802	4,782	3,956	533	246	348	975	1,551	1	5,827	36,020	**99**
2033	17,984	4,829	3,993	539	249	353	986	1,575	1	5,886	36,394	**100**
2034	18,170	4,878	4,029	545	251	358	996	1,598	1	5,945	36,772	**101**
2035	18,360	4,928	4,066	550	254	364	1,007	1,621	1	6,006	37,157	**102**
2036	18,553	4,978	4,103	556	257	369	1,018	1,644	1	6,068	37,547	**103**
2037	18,748	5,029	4,140	562	260	374	1,028	1,668	1	6,130	37,940	**104**
2038	18,945	5,081	4,178	568	262	379	1,039	1,691	1	6,193	38,338	**105**
2039	19,142	5,133	4,214	574	265	384	1,050	1,714	1	6,256	38,733	**106**
2040	19,341	5,185	4,254	580	268	390	1,061	1,737	1	6,320	39,136	**107**
2041	19,539	5,237	4,291	586	271	395	1,072	1,760	1	6,383	39,536	**108**
2042	19,734	5,289	4,329	592	273	400	1,083	1,783	1	6,446	39,930	**109**
2043	19,926	5,339	4,366	598	276	405	1,094	1,805	1	6,508	40,317	**110**
2044	20,113	5,388	4,402	604	279	410	1,105	1,827	1	6,569	40,697	**111**
2045	20,297	5,436	4,439	610	281	415	1,115	1,849	1	6,629	41,072	**113**
2046	20,476	5,483	4,473	615	284	419	1,125	1,870	1	6,688	41,435	**114**
2047	20,652	5,529	4,508	621	287	424	1,136	1,891	1	6,745	41,792	**114**
2048	20,823	5,574	4,542	626	289	429	1,146	1,912	1	6,801	42,142	**115**
2049	20,990	5,617	4,575	632	292	433	1,156	1,932	1	6,856	42,483	**116**
2050	21,153	5,660	4,608	637	294	438	1,165	1,952	1	6,910	42,817	**117**

Hall Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Industrial	Irrigation	Other	ew Commerci	Self Supplied	NRW	Total	AADD (MGD)
2015	2,472	454	709	1,814	110	29	0	524	1,094	7,206	**20**
2016	2,571	467	727	1,870	114	30	0	517	1,132	7,428	**20**
2017	2,665	479	742	1,914	116	31	0	511	1,164	7,622	**21**
2018	2,753	490	753	1,946	118	32	0	504	1,191	7,788	**21**
2019	2,836	501	762	1,976	120	33	0	498	1,215	7,941	**22**
2020	2,915	511	771	2,002	122	34	0	491	1,236	8,082	**22**
2021	2,989	520	779	2,029	123	35	0	485	1,256	8,217	**23**
2022	3,060	529	787	2,053	125	35	0	479	1,275	8,342	**23**
2023	3,127	537	795	2,079	126	36	0	472	1,294	8,467	**23**
2024	3,193	545	803	2,103	128	37	0	465	1,312	8,587	**24**
2025	3,256	552	811	2,128	129	38	0	459	1,330	8,703	**24**
2026	3,318	559	819	2,152	131	38	0	452	1,347	8,817	**24**
2027	3,379	566	827	2,178	132	39	0	446	1,364	8,932	**24**
2028	3,438	573	835	2,203	134	40	0	439	1,381	9,044	**25**
2029	3,497	580	843	2,227	135	41	0	433	1,398	9,155	**25**
2030	3,554	587	851	2,252	137	41	0	426	1,415	9,264	**25**
2031	3,608	593	859	2,276	138	42	0	420	1,430	9,367	**26**
2032	3,661	599	867	2,300	140	43	0	414	1,445	9,467	**26**
2033	3,712	604	874	2,323	141	43	0	408	1,459	9,564	**26**
2034	3,761	610	882	2,346	143	44	0	402	1,473	9,661	**26**
2035	3,810	615	889	2,369	144	45	0	396	1,487	9,755	**27**
2036	3,857	621	896	2,391	145	45	0	391	1,500	9,848	**27**
2037	3,903	626	904	2,414	147	46	0	386	1,514	9,939	**27**
2038	3,948	631	911	2,436	148	46	0	381	1,527	10,028	**27**
2039	3,992	636	918	2,457	149	47	0	376	1,540	10,115	**28**
2040	4,035	641	925	2,480	151	48	0	371	1,553	10,203	**28**
2041	4,077	646	933	2,504	152	48	0	366	1,565	10,291	**28**
2042	4,116	650	940	2,525	154	49	0	361	1,578	10,374	**28**
2043	4,155	655	947	2,548	155	49	0	357	1,590	10,456	**29**
2044	4,192	659	954	2,571	156	50	0	352	1,602	10,537	**29**
2045	4,228	663	962	2,594	158	50	0	348	1,614	10,617	**29**
2046	4,263	667	969	2,616	159	50	0	344	1,626	10,694	**29**
2047	4,297	671	976	2,639	160	51	0	339	1,637	10,770	**30**
2048	4,330	674	983	2,661	162	51	0	335	1,648	10,845	**30**
2049	4,362	678	990	2,684	163	52	0	331	1,660	10,920	**30**
2050	4,394	681	998	2,707	165	52	0	327	1,671	10,994	**30**

Henry Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self Supplied	ew Commerc	NRW	Total	AADD (MGD)
2015	4,088	787	600	140	9	200	205	293	1	2,100	8,423	**23**
2016	4,213	808	617	145	9	207	211	290	1	2,165	8,666	**24**
2017	4,335	828	631	148	9	212	217	287	1	2,224	8,893	**24**
2018	4,451	846	641	151	10	216	223	285	1	2,279	9,102	**25**
2019	4,561	864	650	154	10	220	229	282	1	2,329	9,300	**25**
2020	4,666	881	659	156	10	223	235	279	1	2,375	9,485	**26**
2021	4,766	897	667	158	10	226	240	276	1	2,419	9,661	**26**
2022	4,861	913	674	160	11	229	245	273	1	2,462	9,829	**27**
2023	4,953	927	680	162	11	232	250	271	1	2,502	9,988	**27**
2024	5,041	941	686	164	11	234	255	268	1	2,540	10,141	**28**
2025	5,126	954	692	165	11	237	260	265	1	2,578	10,290	**28**
2026	5,209	967	699	167	11	239	265	263	1	2,614	10,436	**29**
2027	5,290	980	705	169	12	242	270	260	1	2,650	10,578	**29**
2028	5,369	992	712	171	12	245	275	257	1	2,685	10,719	**29**
2029	5,447	1,004	719	173	12	248	280	255	1	2,720	10,859	**30**
2030	5,524	1,016	726	175	12	250	285	252	1	2,755	10,996	**30**
2031	5,595	1,027	733	177	12	253	290	250	1	2,786	11,124	**30**
2032	5,663	1,037	740	179	13	256	294	247	1	2,816	11,245	**31**
2033	5,730	1,047	747	180	13	258	298	245	1	2,844	11,364	**31**
2034	5,794	1,057	753	182	13	261	302	242	1	2,872	11,478	**31**
2035	5,856	1,066	760	184	13	264	306	240	1	2,899	11,589	**32**
2036	5,915	1,075	766	186	13	266	310	237	1	2,925	11,696	**32**
2037	5,973	1,084	773	188	13	269	314	235	1	2,950	11,799	**32**
2038	6,028	1,093	779	189	14	271	317	233	1	2,975	11,899	**33**
2039	6,081	1,101	785	191	14	274	320	230	1	2,998	11,994	**33**
2040	6,132	1,108	791	193	14	276	324	228	1	3,020	12,087	**33**
2041	6,181	1,116	797	195	14	279	327	226	1	3,042	12,176	**33**
2042	6,227	1,123	802	196	14	281	330	224	1	3,063	12,260	**34**
2043	6,269	1,129	808	198	14	283	332	221	1	3,082	12,338	**34**
2044	6,310	1,135	813	199	14	285	335	219	1	3,100	12,412	**34**
2045	6,347	1,141	818	201	15	287	337	217	1	3,118	12,482	**34**
2046	6,382	1,146	823	202	15	289	340	215	1	3,134	12,546	**34**
2047	6,415	1,151	827	203	15	291	342	213	1	3,149	12,607	**35**
2048	6,446	1,155	832	205	15	293	344	211	1	3,163	12,663	**35**
2049	6,475	1,159	836	206	15	295	346	208	1	3,176	12,717	**35**
2050	6,502	1,163	840	207	15	297	348	206	1	3,189	12,769	**35**

Paulding Enhanced Efficiency, Scenario 1

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)									
	Single Family	Multifamily	Commercial	Municipal	Irrigation	New Commercia	Self Supplied	NRW	Total	AADD (MGD)
2015	2,527	228	376	213	32	1	83	1,087	4,547	**12**
2016	2,574	232	376	217	34	1	82	1,110	4,627	**13**
2017	2,627	236	376	223	35	1	81	1,132	4,711	**13**
2018	2,682	241	376	228	36	1	80	1,154	4,799	**13**
2019	2,740	246	376	234	37	1	80	1,176	4,889	**13**
2020	2,798	250	376	240	38	1	79	1,198	4,980	**14**
2021	2,856	255	376	246	38	1	78	1,220	5,070	**14**
2022	2,914	260	376	252	39	1	77	1,241	5,160	**14**
2023	2,970	264	376	257	40	1	77	1,262	5,247	**14**
2024	3,025	269	376	263	40	1	76	1,283	5,333	**15**
2025	3,080	273	376	270	41	1	75	1,304	5,419	**15**
2026	3,134	278	376	276	41	1	74	1,325	5,504	**15**
2027	3,189	282	376	282	42	1	74	1,346	5,591	**15**
2028	3,244	286	376	288	42	1	73	1,367	5,677	**16**
2029	3,300	291	376	295	43	1	72	1,388	5,765	**16**
2030	3,357	295	376	302	44	1	71	1,409	5,855	**16**
2031	3,411	300	376	308	44	1	71	1,430	5,940	**16**
2032	3,466	304	376	315	45	1	70	1,450	6,027	**17**
2033	3,522	308	376	321	45	1	69	1,470	6,113	**17**
2034	3,577	313	376	328	46	1	69	1,491	6,200	**17**
2035	3,634	317	376	334	47	1	68	1,511	6,288	**17**
2036	3,691	322	376	341	47	1	67	1,532	6,377	**17**
2037	3,748	326	376	347	48	1	66	1,553	6,466	**18**
2038	3,805	331	376	353	49	1	66	1,574	6,554	**18**
2039	3,861	336	376	360	49	1	65	1,595	6,643	**18**
2040	3,918	340	376	366	50	1	65	1,615	6,731	**18**
2041	3,973	345	376	372	50	1	64	1,636	6,817	**19**
2042	4,027	349	376	378	51	1	63	1,656	6,901	**19**
2043	4,079	353	376	384	52	1	63	1,675	6,982	**19**
2044	4,129	357	376	390	52	1	62	1,694	7,061	**19**
2045	4,178	361	376	395	53	1	61	1,712	7,137	**20**
2046	4,225	365	376	401	53	1	61	1,729	7,210	**20**
2047	4,269	369	376	406	54	1	60	1,746	7,280	**20**
2048	4,311	372	376	411	54	1	60	1,761	7,346	**20**
2049	4,351	375	376	415	54	1	59	1,776	7,409	**20**
2050	4,390	378	376	420	55	1	58	1,791	7,469	**20**

Rockdale Enhanced Efficiency, Scenario 1

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family Resid	Family Resid	Commercial	Institutional	Industrial	Irrigation	Other	Self Supplied	ew Commerc	NRW	Total	AADD (MGD)
2015	1,854	209	485	56	84	52	345	229	1	1,366	4,681	**13**
2016	1,882	212	500	57	87	54	350	227	1	1,388	4,756	**13**
2017	1,912	214	512	58	89	55	356	224	1	1,412	4,833	**13**
2018	1,943	217	520	59	91	56	362	221	1	1,435	4,905	**13**
2019	1,974	219	528	60	92	57	368	219	1	1,456	4,975	**14**
2020	2,004	222	535	61	94	58	375	216	1	1,477	5,042	**14**
2021	2,034	225	541	62	95	59	381	213	1	1,496	5,107	**14**
2022	2,063	227	546	63	96	60	387	211	1	1,515	5,169	**14**
2023	2,092	230	551	64	97	60	393	208	1	1,533	5,229	**14**
2024	2,120	232	556	65	99	61	399	206	1	1,550	5,288	**14**
2025	2,147	234	561	66	100	62	405	203	1	1,567	5,346	**15**
2026	2,175	237	566	67	101	62	412	200	1	1,585	5,405	**15**
2027	2,203	239	572	68	102	63	418	198	1	1,602	5,465	**15**
2028	2,231	241	577	69	103	64	424	195	1	1,620	5,526	**15**
2029	2,259	244	583	70	104	64	431	192	1	1,639	5,587	**15**
2030	2,288	246	589	71	106	65	438	190	1	1,657	5,650	**15**
2031	2,315	248	594	73	107	66	445	187	1	1,675	5,710	**16**
2032	2,343	251	600	74	108	67	451	185	1	1,692	5,770	**16**
2033	2,370	253	605	75	109	67	458	182	1	1,709	5,830	**16**
2034	2,398	256	611	76	110	68	464	180	1	1,726	5,889	**16**
2035	2,426	258	617	77	111	69	471	178	1	1,743	5,950	**16**
2036	2,454	260	622	78	113	70	477	175	1	1,761	6,011	**16**
2037	2,483	263	628	79	114	70	484	173	1	1,778	6,072	**17**
2038	2,511	265	633	80	115	71	490	171	1	1,796	6,133	**17**
2039	2,540	268	639	81	116	72	496	169	1	1,813	6,195	**17**
2040	2,568	270	644	82	117	73	502	167	1	1,831	6,256	**17**
2041	2,597	273	650	83	119	73	509	165	1	1,849	6,318	**17**
2042	2,625	275	655	84	120	74	515	163	1	1,867	6,378	**17**
2043	2,652	278	661	85	121	75	521	161	1	1,884	6,438	**18**
2044	2,680	280	666	86	122	75	527	159	1	1,901	6,497	**18**
2045	2,707	282	672	87	123	76	533	157	1	1,918	6,556	**18**
2046	2,733	284	677	88	124	77	539	155	1	1,935	6,613	**18**
2047	2,759	287	682	89	125	78	545	154	1	1,951	6,669	**18**
2048	2,784	289	686	90	126	78	550	152	1	1,967	6,724	**18**
2049	2,810	291	691	91	127	79	556	150	1	1,984	6,780	**19**
2050	2,836	293	696	92	129	79	562	148	1	2,000	6,836	**19**

Attachment 9

Bartow Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multi Family	Commercial	Industrial	Irrigation	Agricultural	Self Supplied	New Commercial	Anheuser-Busch	NRW	Total	AADD (MGD)
2015	2,003	222	392	2,103	23	17	207	4	1,826	2,991	9,787	**27**
2016	2,021	224	398	2,139	23	17	206	101	1,826	3,022	9,976	**27**
2017	2,040	225	401	2,163	23	17	205	169	1,826	3,080	10,149	**28**
2018	2,057	227	403	2,176	24	17	204	208	1,826	3,133	10,275	**28**
2019	2,074	228	405	2,189	24	17	203	243	1,826	3,170	10,378	**28**
2020	2,090	230	406	2,201	24	17	202	277	1,826	3,202	10,473	**29**
2021	2,106	231	408	2,214	24	17	201	315	1,826	3,231	10,572	**29**
2022	2,121	232	410	2,226	24	17	200	351	1,826	3,261	10,667	**29**
2023	2,135	233	412	2,241	24	17	199	392	1,826	3,290	10,769	**30**
2024	2,148	234	413	2,253	24	17	198	427	1,826	3,319	10,859	**30**
2025	2,160	235	415	2,265	25	17	197	461	1,826	3,346	10,947	**30**
2026	2,170	236	416	2,277	25	17	196	494	1,826	3,371	11,027	**30**
2027	2,180	236	418	2,289	25	17	195	530	1,826	3,396	11,112	**30**
2028	2,190	237	420	2,303	25	17	194	568	1,826	3,422	11,201	**31**
2029	2,199	238	422	2,315	25	17	193	603	1,826	3,449	11,287	**31**
2030	2,208	238	423	2,327	25	17	192	638	1,826	3,475	11,371	**31**
2031	2,215	239	426	2,344	25	17	191	686	1,826	3,497	11,466	**31**
2032	2,222	239	428	2,362	26	17	190	735	1,826	3,526	11,571	**32**
2033	2,229	239	431	2,379	26	17	189	783	1,826	3,559	11,677	**32**
2034	2,237	240	433	2,395	26	17	188	828	1,826	3,591	11,782	**32**
2035	2,246	241	436	2,411	26	17	187	873	1,826	3,623	11,885	**33**
2036	2,253	241	438	2,425	26	17	186	915	1,826	3,651	11,978	**33**
2037	2,260	241	440	2,439	26	17	185	954	1,826	3,680	12,069	**33**
2038	2,268	242	442	2,453	27	17	184	994	1,826	3,708	12,160	**33**
2039	2,275	243	444	2,466	27	17	183	1,031	1,826	3,736	12,248	**34**
2040	2,284	243	446	2,482	27	17	182	1,075	1,826	3,763	12,343	**34**
2041	2,290	244	448	2,495	27	17	182	1,112	1,826	3,789	12,429	**34**
2042	2,297	244	449	2,508	27	17	181	1,148	1,826	3,816	12,513	**34**
2043	2,304	244	451	2,521	27	17	180	1,186	1,826	3,841	12,598	**35**
2044	2,311	245	453	2,535	28	17	179	1,224	1,826	3,867	12,684	**35**
2045	2,318	245	455	2,548	28	17	178	1,261	1,826	3,894	12,769	**35**
2046	2,324	246	457	2,559	28	17	177	1,293	1,826	3,919	12,845	**35**
2047	2,331	246	458	2,570	28	17	176	1,325	1,826	3,942	12,919	**35**
2048	2,337	247	459	2,580	28	17	175	1,352	1,826	3,964	12,985	**36**
2049	2,343	247	461	2,589	28	17	174	1,380	1,826	3,984	13,050	**36**
2050	2,349	248	462	2,599	28	17	174	1,407	1,826	4,004	13,113	**36**

Cherokee Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Irrigation	Agricultural	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	3,950	563	245	50	223	250	99	152	365	1	1,184	7,081	**19**
2016	4,039	573	251	51	230	259	99	155	362	1	1,211	7,232	**20**
2017	4,126	583	256	52	236	265	99	159	359	1	1,237	7,374	**20**
2018	4,213	593	259	53	240	270	99	162	357	1	1,260	7,508	**21**
2019	4,308	604	263	54	245	274	99	166	354	1	1,285	7,653	**21**
2020	4,401	615	265	56	248	278	99	170	351	1	1,309	7,794	**21**
2021	4,493	625	268	57	252	282	99	174	348	1	1,333	7,933	**22**
2022	4,584	636	270	58	255	286	99	178	345	1	1,356	8,068	**22**
2023	4,674	646	273	60	258	289	99	182	342	1	1,378	8,200	**22**
2024	4,772	657	275	61	261	293	99	186	339	1	1,403	8,348	**23**
2025	4,868	668	278	62	265	297	99	190	336	1	1,427	8,493	**23**
2026	4,967	678	281	64	269	302	99	195	333	1	1,452	8,641	**24**
2027	5,064	689	284	65	273	306	99	199	330	1	1,477	8,788	**24**
2028	5,159	700	288	67	277	311	99	204	327	1	1,501	8,933	**24**
2029	5,254	710	291	68	281	315	99	208	324	1	1,525	9,075	**25**
2030	5,347	720	294	70	285	320	99	212	321	1	1,549	9,217	**25**
2031	5,446	730	298	71	289	325	99	217	318	1	1,575	9,368	**26**
2032	5,546	741	302	73	294	330	99	222	315	1	1,600	9,522	**26**
2033	5,647	752	306	74	299	335	99	227	312	1	1,625	9,677	**27**
2034	5,750	764	310	76	304	341	99	231	309	1	1,651	9,835	**27**
2035	5,853	775	314	77	309	346	99	236	306	1	1,677	9,994	**27**
2036	5,964	788	318	79	314	353	99	241	304	1	1,706	10,167	**28**
2037	6,076	800	323	81	320	359	99	246	301	1	1,735	10,341	**28**
2038	6,188	813	328	82	326	365	99	251	299	1	1,764	10,516	**29**
2039	6,301	826	332	84	331	372	99	256	296	1	1,793	10,692	**29**
2040	6,414	839	337	86	337	378	99	261	294	1	1,822	10,869	**30**
2041	6,537	853	340	87	341	382	99	266	292	1	1,854	11,052	**30**
2042	6,659	867	344	89	345	387	99	272	290	1	1,885	11,236	**31**
2043	6,781	881	347	91	350	393	99	277	287	1	1,915	11,422	**31**
2044	6,902	895	352	93	355	398	99	283	285	1	1,946	11,608	**32**
2045	7,023	908	356	94	360	404	99	288	283	1	1,977	11,793	**32**
2046	7,156	924	360	96	365	410	99	294	281	1	2,012	11,998	**33**
2047	7,289	939	364	98	371	416	99	300	279	1	2,046	12,201	**33**
2048	7,421	954	369	100	376	422	99	306	277	1	2,080	12,403	**34**
2049	7,552	969	372	102	381	427	99	312	275	1	2,113	12,603	**35**
2050	7,683	984	376	104	385	432	99	318	273	1	2,146	12,800	**35**

Clayton Enhanced Efficiency, Scenario 2

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Agricultural	Other	New Commercia	NRW	Total	AADD (MGD)
2015	3,948	1,821	999	413	836	3	19	1	869	8,910	**24**
2016	3,974	1,832	996	425	845	3	20	166	878	9,137	**25**
2017	3,999	1,843	993	434	853	3	20	294	900	9,338	**26**
2018	4,023	1,853	990	440	862	3	20	382	920	9,493	**26**
2019	4,041	1,861	987	445	869	3	20	452	934	9,613	**26**
2020	4,059	1,868	984	449	876	3	20	511	946	9,717	**27**
2021	4,076	1,875	982	453	883	3	20	568	956	9,818	**27**
2022	4,092	1,882	979	457	891	3	21	621	966	9,911	**27**
2023	4,107	1,888	976	460	898	3	21	667	975	9,995	**27**
2024	4,116	1,892	974	463	904	3	21	708	982	10,063	**28**
2025	4,125	1,895	971	466	911	3	21	753	988	10,133	**28**
2026	4,130	1,897	969	469	916	3	21	793	995	10,194	**28**
2027	4,135	1,898	967	472	922	3	21	836	1,001	10,256	**28**
2028	4,140	1,899	964	476	928	3	21	881	1,007	10,319	**28**
2029	4,143	1,900	962	479	934	3	22	923	1,013	10,379	**28**
2030	4,146	1,901	960	481	939	3	22	963	1,019	10,435	**29**
2031	4,144	1,899	958	484	944	3	22	995	1,023	10,471	**29**
2032	4,143	1,898	956	486	948	3	22	1,029	1,026	10,511	**29**
2033	4,143	1,898	953	489	953	3	22	1,064	1,030	10,555	**29**
2034	4,144	1,898	951	491	957	3	22	1,097	1,035	10,598	**29**
2035	4,147	1,898	949	493	962	3	22	1,130	1,039	10,643	**29**
2036	4,145	1,897	947	495	965	3	22	1,154	1,042	10,670	**29**
2037	4,145	1,896	945	496	968	3	22	1,175	1,044	10,696	**29**
2038	4,145	1,896	943	498	972	3	22	1,196	1,047	10,721	**29**
2039	4,145	1,895	941	499	975	3	23	1,216	1,049	10,747	**29**
2040	4,147	1,896	939	501	978	3	23	1,240	1,052	10,778	**30**
2041	4,145	1,894	937	502	980	3	23	1,255	1,054	10,793	**30**
2042	4,143	1,893	935	503	983	3	23	1,268	1,055	10,806	**30**
2043	4,141	1,892	933	504	985	3	23	1,284	1,057	10,821	**30**
2044	4,140	1,890	931	505	987	3	23	1,300	1,058	10,838	**30**
2045	4,139	1,889	929	507	989	3	23	1,318	1,060	10,858	**30**
2046	4,135	1,887	927	507	991	3	23	1,329	1,061	10,864	**30**
2047	4,131	1,885	925	508	993	3	23	1,342	1,061	10,872	**30**
2048	4,128	1,883	923	509	994	3	23	1,354	1,062	10,879	**30**
2049	4,124	1,881	922	510	996	3	23	1,365	1,063	10,887	**30**
2050	4,121	1,879	920	511	997	3	23	1,378	1,064	10,895	**30**

Cobb Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercia	NRW	Total	AADD (MGD)
2015	12,497	3,621	5,223	682	392	0	779	1	1	2,190	25,385	**70**
2016	12,611	3,652	5,407	691	408	0	811	1	1	2,218	25,799	**71**
2017	12,723	3,682	5,555	699	421	0	837	1	1	2,254	26,172	**72**
2018	12,831	3,712	5,667	708	431	0	857	1	1	2,286	26,493	**73**
2019	12,929	3,738	5,761	716	439	0	874	1	1	2,312	26,770	**73**
2020	13,024	3,763	5,842	724	447	0	889	1	1	2,336	27,026	**74**
2021	13,118	3,788	5,916	732	453	0	902	1	1	2,358	27,269	**75**
2022	13,207	3,811	5,980	740	459	0	914	1	1	2,379	27,492	**75**
2023	13,294	3,834	6,042	749	465	0	926	1	1	2,398	27,708	**76**
2024	13,368	3,852	6,097	756	470	0	936	1	1	2,415	27,897	**76**
2025	13,440	3,870	6,150	764	476	0	946	1	1	2,431	28,078	**77**
2026	13,504	3,886	6,195	771	480	0	955	1	1	2,445	28,238	**77**
2027	13,566	3,901	6,238	778	484	0	963	1	1	2,459	28,391	**78**
2028	13,625	3,915	6,282	786	488	0	972	1	1	2,472	28,542	**78**
2029	13,683	3,928	6,321	793	492	0	980	1	1	2,485	28,683	**79**
2030	13,738	3,941	6,355	800	496	0	986	1	1	2,497	28,815	**79**
2031	13,781	3,949	6,388	807	499	0	993	1	1	2,506	28,924	**79**
2032	13,827	3,960	6,419	813	502	0	999	1	1	2,516	29,038	**80**
2033	13,877	3,971	6,453	820	506	0	1,006	1	1	2,525	29,160	**80**
2034	13,931	3,984	6,486	826	509	0	1,013	1	1	2,536	29,286	**80**
2035	13,987	3,997	6,520	833	512	0	1,019	1	1	2,547	29,418	**81**
2036	14,035	4,009	6,550	839	515	0	1,025	1	1	2,556	29,531	**81**
2037	14,085	4,021	6,579	845	518	0	1,031	1	1	2,565	29,647	**81**
2038	14,137	4,034	6,608	851	521	0	1,037	1	1	2,575	29,765	**82**
2039	14,191	4,047	6,636	857	524	0	1,043	1	1	2,586	29,885	**82**
2040	14,246	4,061	6,669	862	528	0	1,050	1	1	2,596	30,013	**82**
2041	14,292	4,073	6,695	868	530	0	1,055	1	1	2,605	30,119	**83**
2042	14,339	4,084	6,723	873	533	0	1,061	1	1	2,614	30,229	**83**
2043	14,386	4,096	6,753	878	536	0	1,067	1	1	2,623	30,341	**83**
2044	14,433	4,108	6,784	883	540	0	1,074	1	1	2,633	30,456	**83**
2045	14,480	4,120	6,817	888	543	0	1,080	1	1	2,643	30,573	**84**
2046	14,521	4,130	6,848	893	546	0	1,087	1	1	2,652	30,678	**84**
2047	14,562	4,140	6,881	898	549	0	1,093	1	1	2,661	30,785	**84**
2048	14,602	4,150	6,913	903	553	0	1,100	1	1	2,670	30,892	**85**
2049	14,642	4,160	6,948	907	556	0	1,107	1	1	2,679	31,002	**85**
2050	14,682	4,170	6,984	912	560	0	1,114	1	1	2,689	31,112	**85**

Coweta Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercia	Self-Supplied	NRW	Total	AADD (MGD)
2015	2,234	320	496	66	305	370	181	0	405	483	4,860	**13**
2016	2,282	325	504	68	311	377	185	0	400	493	4,944	**14**
2017	2,330	330	509	69	315	384	187	0	395	501	5,021	**14**
2018	2,376	334	513	70	317	392	189	0	390	509	5,091	**14**
2019	2,425	339	516	72	320	399	190	0	386	516	5,164	**14**
2020	2,473	344	519	73	322	407	192	0	381	523	5,235	**14**
2021	2,520	349	522	75	325	415	193	0	376	530	5,306	**15**
2022	2,567	354	525	76	327	422	195	0	371	537	5,375	**15**
2023	2,612	358	528	77	329	430	196	0	366	544	5,442	**15**
2024	2,659	363	531	79	332	438	197	0	361	551	5,512	**15**
2025	2,705	368	534	80	334	446	199	0	357	558	5,582	**15**
2026	2,751	372	538	82	337	454	201	0	352	565	5,652	**15**
2027	2,795	377	542	83	340	462	202	0	347	572	5,721	**16**
2028	2,839	381	546	85	343	471	204	0	342	579	5,790	**16**
2029	2,883	386	551	86	346	479	206	0	337	586	5,859	**16**
2030	2,925	390	555	87	350	487	208	0	332	592	5,927	**16**
2031	2,968	394	560	89	353	495	210	0	328	599	5,997	**16**
2032	3,011	398	566	90	357	503	213	0	323	606	6,068	**17**
2033	3,055	403	571	92	361	512	215	0	319	613	6,142	**17**
2034	3,100	407	577	93	366	520	218	0	314	621	6,216	**17**
2035	3,145	412	583	95	370	528	220	0	310	628	6,292	**17**
2036	3,192	417	590	96	375	537	223	0	306	636	6,372	**17**
2037	3,239	422	597	98	379	545	226	0	302	644	6,452	**18**
2038	3,287	427	603	100	384	554	229	0	298	652	6,533	**18**
2039	3,335	432	610	101	389	562	232	0	295	660	6,615	**18**
2040	3,383	437	618	103	394	571	235	0	291	668	6,698	**18**
2041	3,433	442	625	104	400	579	238	0	287	676	6,786	**19**
2042	3,483	447	633	106	406	588	241	0	284	685	6,873	**19**
2043	3,533	453	641	107	411	597	245	0	280	694	6,962	**19**
2044	3,583	458	650	109	417	606	248	0	277	702	7,051	**19**
2045	3,633	463	659	110	423	615	252	0	273	711	7,140	**20**
2046	3,685	468	668	112	430	624	256	0	270	721	7,234	**20**
2047	3,737	474	677	114	436	633	260	0	267	730	7,328	**20**
2048	3,789	479	686	115	443	643	264	0	264	739	7,422	**20**
2049	3,841	485	696	117	450	652	268	0	260	749	7,517	**21**
2050	3,892	490	705	119	456	661	272	0	257	758	7,611	**21**

DeKalb Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Residential	Apt/Condo (MFR	Commercial	nstitutional (SCH	Municipal (GOV)	Other	Irrigation	New Commercia	NRW	Total	AAD (MGD)
2015	10,756	3,847	4,889	227	137	26	645	1	5,441	25,969	**71**
2016	10,812	3,862	5,023	229	138	27	666	1	5,489	26,248	**72**
2017	10,866	3,877	5,129	231	139	27	683	1	5,547	26,499	**73**
2018	10,917	3,890	5,203	233	140	27	695	1	5,600	26,707	**73**
2019	10,952	3,898	5,261	235	141	27	705	1	5,635	26,855	**74**
2020	10,986	3,905	5,310	237	142	28	713	1	5,666	26,988	**74**
2021	11,018	3,911	5,357	238	143	28	721	1	5,694	27,112	**74**
2022	11,047	3,916	5,398	240	144	28	728	1	5,720	27,222	**75**
2023	11,074	3,919	5,435	242	145	28	735	1	5,743	27,322	**75**
2024	11,084	3,917	5,460	243	146	28	740	1	5,756	27,375	**75**
2025	11,093	3,914	5,483	244	147	28	744	1	5,767	27,421	**75**
2026	11,094	3,908	5,499	246	148	29	748	1	5,773	27,444	**75**
2027	11,093	3,901	5,513	247	148	29	751	1	5,778	27,461	**75**
2028	11,091	3,894	5,528	248	149	29	754	1	5,782	27,475	**75**
2029	11,087	3,886	5,538	249	150	29	757	1	5,784	27,480	**75**
2030	11,081	3,877	5,545	251	151	29	759	1	5,785	27,478	**75**
2031	11,062	3,863	5,548	251	151	29	760	1	5,777	27,444	**75**
2032	11,047	3,852	5,551	252	152	29	761	1	5,770	27,415	**75**
2033	11,035	3,841	5,557	253	152	29	763	1	5,764	27,396	**75**
2034	11,026	3,833	5,563	254	153	30	765	1	5,760	27,384	**75**
2035	11,020	3,825	5,570	255	153	30	767	1	5,757	27,378	**75**
2036	11,005	3,815	5,572	256	154	30	768	1	5,750	27,350	**75**
2037	10,993	3,806	5,573	256	154	30	769	1	5,744	27,325	**75**
2038	10,982	3,797	5,573	257	154	30	770	1	5,739	27,303	**75**
2039	10,973	3,790	5,572	258	155	30	771	1	5,734	27,283	**75**
2040	10,965	3,783	5,576	258	155	30	773	1	5,730	27,270	**75**
2041	10,950	3,774	5,573	259	155	30	773	1	5,722	27,238	**75**
2042	10,936	3,765	5,572	259	156	30	774	1	5,715	27,209	**75**
2043	10,923	3,757	5,572	259	156	30	775	1	5,709	27,183	**74**
2044	10,910	3,749	5,574	260	156	30	776	1	5,704	27,159	**74**
2045	10,897	3,741	5,576	260	156	30	777	1	5,699	27,138	**74**
2046	10,879	3,731	5,576	260	157	30	778	1	5,691	27,104	**74**
2047	10,861	3,721	5,578	261	157	30	779	1	5,684	27,072	**74**
2048	10,843	3,712	5,580	261	157	30	781	1	5,677	27,041	**74**
2049	10,825	3,702	5,582	261	157	30	782	1	5,671	27,012	**74**
2050	10,808	3,692	5,586	261	157	30	783	1	5,664	26,983	**74**

Douglas Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	ew Commerci	NRW	Total	AADD (MGD)
2015	2,284	546	375	78	114	186	86	0	899	4,567	13
2016	2,320	554	387	79	118	189	89	0	917	4,654	13
2017	2,355	562	397	81	122	193	92	0	934	4,735	13
2018	2,389	569	405	82	125	197	95	0	950	4,811	13
2019	2,424	577	412	84	128	200	97	0	965	4,887	13
2020	2,459	585	418	85	130	204	99	0	980	4,960	14
2021	2,493	592	423	87	133	208	100	0	994	5,031	14
2022	2,527	599	429	89	135	212	102	0	1,008	5,100	14
2023	2,559	606	433	90	137	215	103	0	1,022	5,167	14
2024	2,593	613	438	92	139	219	105	0	1,035	5,234	14
2025	2,625	620	443	93	141	223	106	0	1,049	5,301	15
2026	2,657	627	447	95	143	227	108	0	1,062	5,366	15
2027	2,689	634	452	97	144	231	109	0	1,074	5,430	15
2028	2,720	640	456	98	146	235	111	0	1,087	5,494	15
2029	2,750	646	461	100	148	239	112	0	1,099	5,556	15
2030	2,780	652	465	102	150	243	113	0	1,111	5,617	15
2031	2,809	658	470	103	152	247	115	0	1,124	5,678	16
2032	2,839	665	475	105	154	251	116	0	1,135	5,740	16
2033	2,870	671	480	107	156	255	118	0	1,148	5,803	16
2034	2,902	678	485	108	158	258	119	0	1,160	5,868	16
2035	2,934	684	490	110	160	262	121	0	1,173	5,934	16
2036	2,967	691	495	112	162	266	123	0	1,186	6,003	16
2037	3,001	698	501	113	164	270	124	0	1,199	6,072	17
2038	3,035	706	506	115	166	274	126	0	1,213	6,141	17
2039	3,069	713	511	117	169	278	127	0	1,226	6,211	17
2040	3,103	720	517	118	171	282	129	0	1,240	6,282	17
2041	3,139	728	522	120	173	287	131	0	1,254	6,355	17
2042	3,175	736	528	122	176	291	133	0	1,269	6,428	18
2043	3,210	744	534	123	178	295	134	0	1,283	6,502	18
2044	3,246	751	540	125	180	299	136	0	1,298	6,576	18
2045	3,281	759	546	127	183	303	138	0	1,312	6,649	18
2046	3,318	767	553	129	185	307	140	0	1,327	6,727	18
2047	3,355	775	559	130	188	312	142	0	1,343	6,804	19
2048	3,392	783	565	132	191	316	144	0	1,358	6,881	19
2049	3,429	791	572	134	193	320	146	0	1,373	6,958	19
2050	3,465	798	578	136	196	324	148	0	1,388	7,034	19

Fayette Enhanced Efficiency, Scenario 2

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AAD (MGD)
2015	2,416	157	444	56	29	82	195	478	333	4,189	**11**
2016	2,438	157	458	58	29	85	196	473	335	4,229	**12**
2017	2,459	158	468	60	30	87	198	467	338	4,264	**12**
2018	2,479	159	475	61	30	89	199	462	341	4,295	**12**
2019	2,501	159	482	62	30	90	201	456	344	4,324	**12**
2020	2,522	160	486	63	30	91	202	451	346	4,351	**12**
2021	2,542	161	490	63	31	92	204	445	348	4,377	**12**
2022	2,562	161	493	64	31	93	206	440	350	4,400	**12**
2023	2,582	162	495	64	31	94	207	434	352	4,421	**12**
2024	2,599	162	496	65	31	94	209	429	354	4,439	**12**
2025	2,617	163	497	65	32	95	210	423	355	4,455	**12**
2026	2,631	163	497	65	32	95	211	418	356	4,468	**12**
2027	2,645	163	497	65	32	95	213	412	357	4,479	**12**
2028	2,659	163	497	65	32	95	214	407	358	4,490	**12**
2029	2,672	164	497	65	32	95	216	401	359	4,501	**12**
2030	2,685	164	496	65	33	95	217	396	360	4,510	**12**
2031	2,693	164	495	65	33	95	218	390	360	4,512	**12**
2032	2,701	164	494	65	33	95	219	385	360	4,515	**12**
2033	2,709	164	493	65	33	95	220	380	360	4,519	**12**
2034	2,718	164	492	65	33	95	221	375	360	4,524	**12**
2035	2,728	164	491	65	33	95	222	371	361	4,530	**12**
2036	2,733	164	491	65	33	95	222	366	361	4,530	**12**
2037	2,738	164	490	65	33	95	223	361	361	4,531	**12**
2038	2,744	164	490	65	34	95	223	357	361	4,532	**12**
2039	2,750	164	490	65	34	95	224	353	361	4,535	**12**
2040	2,756	163	490	65	34	96	225	348	361	4,538	**12**
2041	2,759	163	490	66	34	96	225	344	361	4,538	**12**
2042	2,763	163	491	66	34	96	225	340	361	4,538	**12**
2043	2,766	163	491	66	34	96	226	336	361	4,539	**12**
2044	2,769	163	492	66	34	97	226	332	361	4,541	**12**
2045	2,773	163	493	66	34	97	227	328	361	4,542	**12**
2046	2,776	163	495	67	34	97	227	324	361	4,544	**12**
2047	2,779	162	496	67	34	98	227	321	361	4,546	**12**
2048	2,782	162	498	67	34	98	228	317	361	4,548	**12**
2049	2,785	162	499	68	34	99	228	313	362	4,550	**12**
2050	2,788	162	501	68	34	99	228	310	362	4,552	**12**

Forsyth Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Residential	Commercial	Industrial	Municipal	Irrigation	Other	New Commercia	Self Supplied	NRW	Total	AADD (MGD)
2015	4,313	910	456	61	253	36	1	194	1,839	8,063	**22**
2016	4,442	932	468	63	263	38	1	192	1,899	8,297	**23**
2017	4,570	947	477	65	271	39	1	190	1,953	8,512	**23**
2018	4,697	956	482	67	277	40	1	188	2,001	8,709	**24**
2019	4,846	968	489	69	283	41	1	186	2,056	8,939	**24**
2020	4,993	978	495	72	288	43	1	184	2,108	9,161	**25**
2021	5,139	988	501	74	293	44	1	182	2,158	9,380	**26**
2022	5,283	998	507	76	299	46	1	180	2,207	9,597	**26**
2023	5,425	1,007	512	79	303	47	1	179	2,256	9,809	**27**
2024	5,583	1,019	519	81	308	48	1	177	2,312	10,050	**28**
2025	5,740	1,032	526	84	313	50	1	175	2,366	10,287	**28**
2026	5,905	1,046	535	87	318	52	1	173	2,424	10,540	**29**
2027	6,069	1,061	543	90	323	53	1	172	2,481	10,792	**30**
2028	6,230	1,076	552	92	328	55	1	170	2,538	11,043	**30**
2029	6,390	1,092	561	95	334	57	1	168	2,595	11,292	**31**
2030	6,548	1,107	569	98	339	58	1	166	2,651	11,538	**32**
2031	6,730	1,129	581	101	344	60	1	165	2,718	11,828	**32**
2032	6,913	1,151	594	104	349	62	1	163	2,783	12,121	**33**
2033	7,098	1,174	607	107	354	64	1	161	2,849	12,416	**34**
2034	7,283	1,199	621	111	359	66	1	160	2,916	12,715	**35**
2035	7,469	1,225	635	114	364	68	1	158	2,984	13,017	**36**
2036	7,680	1,256	652	117	369	70	1	157	3,063	13,365	**37**
2037	7,891	1,288	670	121	374	72	1	155	3,142	13,713	**38**
2038	8,103	1,320	688	125	379	74	1	154	3,221	14,064	**39**
2039	8,315	1,353	706	128	384	76	1	152	3,300	14,416	**39**
2040	8,527	1,388	725	132	389	78	1	151	3,380	14,772	**40**
2041	8,767	1,430	749	136	394	81	1	149	3,473	15,179	**42**
2042	9,006	1,472	772	140	400	83	1	148	3,565	15,587	**43**
2043	9,245	1,516	796	144	405	86	1	146	3,658	15,997	**44**
2044	9,482	1,562	822	148	410	88	1	145	3,751	16,409	**45**
2045	9,719	1,610	848	152	416	90	1	143	3,845	16,824	**46**
2046	9,991	1,666	879	156	422	93	1	142	3,954	17,304	**47**
2047	10,261	1,726	913	161	428	96	1	140	4,064	17,790	**49**
2048	10,530	1,791	948	166	435	99	1	139	4,174	18,283	**50**
2049	10,799	1,863	988	170	443	101	1	137	4,287	18,789	**51**
2050	11,065	1,943	1,032	175	453	104	1	136	4,402	19,311	**53**

Fulton Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AADD (MGD)
2015	14,658	8,405	13,027	233	621	783	53	173	234	12,600	50,787	**139**
2016	14,854	8,509	13,401	237	641	796	55	176	231	12,812	51,713	**142**
2017	15,046	8,612	13,699	241	657	809	57	179	229	13,042	52,571	**144**
2018	15,235	8,712	13,925	245	670	822	58	182	227	13,255	53,330	**146**
2019	15,423	8,812	14,134	249	681	836	59	185	224	13,446	54,048	**148**
2020	15,607	8,910	14,324	253	692	849	60	187	222	13,623	54,728	**150**
2021	15,789	9,006	14,515	257	703	862	60	190	220	13,791	55,394	**152**
2022	15,965	9,099	14,696	261	713	876	61	193	218	13,955	56,037	**154**
2023	16,136	9,189	14,885	265	724	889	62	196	216	14,114	56,677	**155**
2024	16,304	9,277	15,075	269	734	903	63	199	213	14,273	57,312	**157**
2025	16,468	9,363	15,261	273	745	916	64	202	211	14,430	57,933	**159**
2026	16,627	9,446	15,432	277	754	929	65	205	209	14,583	58,528	**160**
2027	16,783	9,527	15,604	281	764	943	66	208	207	14,730	59,112	**162**
2028	16,934	9,605	15,784	285	774	956	67	211	205	14,874	59,695	**164**
2029	17,083	9,682	15,951	289	783	970	67	214	203	15,017	60,259	**165**
2030	17,227	9,756	16,107	293	792	983	68	217	201	15,156	60,801	**167**
2031	17,368	9,829	16,275	297	801	996	69	220	199	15,290	61,345	**168**
2032	17,515	9,905	16,441	301	811	1,010	70	223	197	15,424	61,896	**170**
2033	17,667	9,983	16,623	305	821	1,023	71	226	195	15,560	62,472	**171**
2034	17,822	10,064	16,805	309	831	1,037	71	229	193	15,702	63,063	**173**
2035	17,981	10,148	16,991	313	841	1,050	72	232	191	15,848	63,667	**174**
2036	18,144	10,233	17,180	317	851	1,063	73	235	189	15,997	64,284	**176**
2037	18,310	10,320	17,369	321	862	1,077	74	238	187	16,150	64,908	**178**
2038	18,478	10,409	17,559	325	873	1,090	75	241	185	16,304	65,540	**180**
2039	18,649	10,499	17,746	329	883	1,104	76	244	183	16,460	66,172	**181**
2040	18,821	10,590	17,949	333	894	1,117	77	247	182	16,617	66,826	**183**
2041	18,996	10,682	18,148	337	905	1,131	78	250	180	16,780	67,487	**185**
2042	19,172	10,775	18,352	341	916	1,144	79	253	178	16,943	68,153	**187**
2043	19,347	10,868	18,558	345	928	1,158	80	256	176	17,108	68,824	**189**
2044	19,523	10,961	18,770	349	939	1,171	81	259	175	17,274	69,502	**190**
2045	19,698	11,053	18,984	353	951	1,185	82	262	173	17,442	70,183	**192**
2046	19,877	11,148	19,207	357	964	1,199	83	265	171	17,615	70,885	**194**
2047	20,056	11,242	19,434	362	976	1,212	84	268	169	17,788	71,592	**196**
2048	20,234	11,336	19,662	366	989	1,226	85	271	168	17,963	72,300	**198**
2049	20,412	11,430	19,897	370	1,002	1,240	86	274	166	18,139	73,015	**200**
2050	20,588	11,523	20,137	374	1,015	1,254	87	277	164	18,316	73,735	**202**

Gwinnett Enhanced Efficiency, Scenario 2

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercia	NRW	Total	AADD (MGD)
2015	15,093	4,070	3,196	414	191	273	757	1,218	1	4,837	30,050	**82**
2016	15,336	4,135	3,312	431	199	278	788	1,242	1	4,934	30,656	**84**
2017	15,575	4,199	3,410	446	206	284	815	1,266	1	5,031	31,232	**86**
2018	15,810	4,261	3,486	457	211	289	836	1,290	1	5,124	31,766	**87**
2019	16,052	4,326	3,558	468	216	295	856	1,315	1	5,214	32,301	**88**
2020	16,291	4,389	3,622	478	221	301	874	1,341	1	5,299	32,816	**90**
2021	16,526	4,452	3,682	487	225	306	891	1,366	1	5,382	33,318	**91**
2022	16,756	4,513	3,736	496	229	312	906	1,391	1	5,462	33,801	**93**
2023	16,980	4,572	3,788	504	232	318	921	1,416	1	5,540	34,271	**94**
2024	17,211	4,633	3,839	512	236	323	936	1,442	1	5,619	34,753	**95**
2025	17,438	4,693	3,890	519	240	329	950	1,469	1	5,696	35,226	**97**
2026	17,662	4,752	3,938	527	243	335	964	1,495	1	5,773	35,691	**98**
2027	17,882	4,810	3,985	534	247	341	977	1,522	1	5,847	36,146	**99**
2028	18,098	4,866	4,033	542	250	347	991	1,548	1	5,920	36,595	**100**
2029	18,310	4,922	4,078	549	253	353	1,003	1,575	1	5,992	37,034	**101**
2030	18,517	4,976	4,119	555	256	359	1,015	1,601	1	6,062	37,461	**103**
2031	18,725	5,030	4,163	562	259	365	1,028	1,628	1	6,132	37,894	**104**
2032	18,939	5,086	4,207	569	262	371	1,040	1,655	1	6,201	38,331	**105**
2033	19,156	5,143	4,252	576	266	377	1,053	1,682	1	6,271	38,776	**106**
2034	19,378	5,202	4,296	582	269	383	1,065	1,709	1	6,342	39,227	**107**
2035	19,604	5,261	4,340	589	272	389	1,078	1,736	1	6,414	39,683	**109**
2036	19,834	5,321	4,385	596	275	395	1,091	1,763	1	6,488	40,150	**110**
2037	20,068	5,383	4,430	603	279	401	1,104	1,790	1	6,563	40,621	**111**
2038	20,303	5,445	4,476	611	282	407	1,117	1,817	1	6,638	41,096	**113**
2039	20,540	5,507	4,521	617	285	414	1,129	1,844	1	6,714	41,573	**114**
2040	20,779	5,570	4,568	625	288	420	1,143	1,871	1	6,791	42,056	**115**
2041	21,024	5,635	4,616	632	292	426	1,157	1,899	1	6,870	42,550	**117**
2042	21,268	5,699	4,663	640	295	432	1,170	1,926	1	6,949	43,043	**118**
2043	21,512	5,763	4,711	647	299	438	1,184	1,954	1	7,028	43,537	**119**
2044	21,755	5,827	4,760	655	302	444	1,198	1,981	1	7,107	44,031	**121**
2045	21,998	5,891	4,809	662	306	450	1,212	2,009	1	7,187	44,524	**122**
2046	22,250	5,957	4,859	670	309	457	1,226	2,037	1	7,269	45,037	**123**
2047	22,501	6,023	4,910	678	313	463	1,241	2,066	1	7,352	45,548	**125**
2048	22,751	6,089	4,961	686	317	470	1,255	2,094	1	7,434	46,058	**126**
2049	23,000	6,154	5,012	694	320	476	1,270	2,123	1	7,515	46,565	**128**
2050	23,248	6,219	5,063	702	324	482	1,284	2,151	1	7,597	47,072	**129**

Hall Enhanced Efficiency, Scenario 2

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Irrigation	Other	New Commercia	Self Supplied	NRW	Total	AADD (MGD)
2015	2,472	454	709	1,814	110	29	0	524	1,094	7,206	**20**
2016	2,519	459	715	1,837	112	30	0	517	1,112	7,301	**20**
2017	2,564	464	719	1,851	113	30	0	511	1,126	7,378	**20**
2018	2,609	470	720	1,856	113	31	0	504	1,138	7,440	**20**
2019	2,655	475	722	1,864	113	31	0	498	1,148	7,506	**21**
2020	2,700	480	723	1,871	114	32	0	491	1,157	7,569	**21**
2021	2,745	485	726	1,881	114	32	0	485	1,167	7,634	**21**
2022	2,788	490	728	1,889	115	33	0	479	1,177	7,698	**21**
2023	2,831	494	731	1,901	116	33	0	472	1,186	7,765	**21**
2024	2,874	499	735	1,914	116	34	0	465	1,197	7,834	**21**
2025	2,917	503	739	1,927	117	34	0	459	1,207	7,903	**22**
2026	2,958	508	743	1,940	118	35	0	452	1,218	7,972	**22**
2027	2,999	512	747	1,955	119	35	0	446	1,228	8,042	**22**
2028	3,039	516	751	1,969	120	36	0	439	1,238	8,110	**22**
2029	3,079	520	755	1,983	121	36	0	433	1,249	8,177	**22**
2030	3,117	524	760	1,998	121	37	0	426	1,259	8,242	**23**
2031	3,156	528	765	2,013	122	37	0	420	1,269	8,310	**23**
2032	3,195	532	770	2,030	123	38	0	414	1,279	8,381	**23**
2033	3,235	536	775	2,047	125	38	0	408	1,290	8,455	**23**
2034	3,276	541	781	2,066	126	39	0	402	1,301	8,531	**23**
2035	3,317	545	787	2,085	127	39	0	396	1,312	8,610	**24**
2036	3,360	550	794	2,106	128	40	0	391	1,325	8,693	**24**
2037	3,403	555	800	2,127	129	40	0	386	1,337	8,778	**24**
2038	3,446	560	807	2,148	131	41	0	381	1,350	8,864	**24**
2039	3,490	565	814	2,171	132	42	0	376	1,363	8,952	**25**
2040	3,534	570	822	2,194	133	42	0	371	1,376	9,043	**25**
2041	3,579	575	830	2,220	135	43	0	366	1,390	9,139	**25**
2042	3,624	581	839	2,245	137	43	0	361	1,405	9,235	**25**
2043	3,670	586	847	2,272	138	44	0	357	1,419	9,333	**26**
2044	3,715	591	856	2,299	140	44	0	352	1,434	9,432	**26**
2045	3,759	596	865	2,327	142	45	0	348	1,449	9,532	**26**
2046	3,806	602	875	2,356	143	45	0	344	1,465	9,637	**26**
2047	3,853	608	885	2,386	145	46	0	339	1,481	9,743	**27**
2048	3,899	613	894	2,416	147	47	0	335	1,497	9,848	**27**
2049	3,945	619	905	2,446	149	47	0	331	1,513	9,955	**27**
2050	3,991	624	915	2,477	151	48	0	327	1,529	10,061	**28**

Henry Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self Supplied	New Commercia	NRW	Total	AADD (MGD)
2015	4,088	787	600	140	9	200	205	293	1	2,100	8,423	**23**
2016	4,165	799	610	143	9	205	209	290	1	2,141	8,571	**23**
2017	4,240	811	618	145	9	208	213	287	1	2,178	8,710	**24**
2018	4,315	823	623	147	9	210	217	285	1	2,212	8,841	**24**
2019	4,394	835	629	148	9	212	221	282	1	2,248	8,979	**25**
2020	4,472	848	633	150	10	214	225	279	1	2,282	9,113	**25**
2021	4,549	860	639	151	10	216	229	276	1	2,315	9,246	**25**
2022	4,625	872	644	153	10	218	234	273	1	2,348	9,377	**26**
2023	4,699	883	648	154	10	220	238	271	1	2,381	9,504	**26**
2024	4,777	895	653	155	10	222	242	268	1	2,415	9,638	**26**
2025	4,853	907	658	157	11	225	247	265	1	2,448	9,771	**27**
2026	4,929	919	664	158	11	227	251	263	1	2,481	9,903	**27**
2027	5,004	930	670	160	11	229	256	260	1	2,514	10,034	**27**
2028	5,077	942	676	162	11	232	261	257	1	2,546	10,164	**28**
2029	5,149	953	682	164	11	234	265	255	1	2,579	10,293	**28**
2030	5,220	964	689	165	12	237	270	252	1	2,610	10,420	**29**
2031	5,292	975	696	167	12	240	274	250	1	2,643	10,550	**29**
2032	5,366	986	703	169	12	243	279	247	1	2,675	10,681	**29**
2033	5,440	997	711	172	12	246	284	245	1	2,708	10,815	**30**
2034	5,515	1,009	719	174	12	249	288	242	1	2,741	10,951	**30**
2035	5,592	1,021	728	176	13	252	293	240	1	2,775	11,089	**30**
2036	5,671	1,033	737	179	13	256	298	237	1	2,810	11,234	**31**
2037	5,751	1,046	746	181	13	259	302	235	1	2,846	11,380	**31**
2038	5,831	1,059	755	184	13	263	307	233	1	2,882	11,527	**32**
2039	5,912	1,072	764	186	13	266	312	230	1	2,919	11,676	**32**
2040	5,993	1,084	774	189	14	270	317	228	1	2,956	11,826	**32**
2041	6,078	1,098	785	192	14	274	322	226	1	2,995	11,984	**33**
2042	6,164	1,112	795	194	14	278	327	224	1	3,035	12,143	**33**
2043	6,249	1,125	806	197	14	283	332	221	1	3,074	12,302	**34**
2044	6,334	1,139	817	200	14	287	337	219	1	3,114	12,462	**34**
2045	6,418	1,153	828	203	15	291	342	217	1	3,153	12,620	**35**
2046	6,509	1,167	839	206	15	296	347	215	1	3,196	12,790	**35**
2047	6,598	1,182	851	210	15	300	352	213	1	3,238	12,960	**36**
2048	6,688	1,196	863	213	15	305	358	211	1	3,280	13,128	**36**
2049	6,777	1,210	875	216	16	309	363	208	1	3,322	13,297	**36**
2050	6,865	1,225	887	219	16	314	368	206	1	3,364	13,465	**37**

Paulding Enhanced Efficiency, Scenario 2

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)									
	Single Family	Multifamily	Commercial	Municipal	Irrigation	New Commercia	Self Supplied	NRW	Total	AADD (MGD)
2015	2,527	228	376	213	32	1	83	1,087	4,547	**12**
2016	2,575	232	391	217	34	1	82	1,111	4,642	**13**
2017	2,622	236	402	222	35	1	81	1,133	4,732	**13**
2018	2,668	240	411	227	36	1	80	1,155	4,816	**13**
2019	2,717	244	418	232	37	1	80	1,177	4,904	**13**
2020	2,765	248	424	237	37	1	79	1,197	4,988	**14**
2021	2,813	251	429	242	38	1	78	1,217	5,069	**14**
2022	2,859	255	434	247	38	1	77	1,237	5,148	**14**
2023	2,905	259	438	252	39	1	77	1,255	5,225	**14**
2024	2,954	263	442	257	39	1	76	1,276	5,308	**15**
2025	3,002	267	447	263	40	1	75	1,296	5,389	**15**
2026	3,051	271	451	268	40	1	74	1,316	5,472	**15**
2027	3,099	274	456	274	41	1	74	1,335	5,553	**15**
2028	3,146	278	460	279	41	1	73	1,355	5,633	**15**
2029	3,192	282	465	285	41	1	72	1,373	5,711	**16**
2030	3,238	285	469	291	42	1	71	1,392	5,789	**16**
2031	3,286	289	475	296	42	1	71	1,412	5,871	**16**
2032	3,335	293	480	302	43	1	70	1,432	5,955	**16**
2033	3,385	297	485	308	44	1	69	1,451	6,040	**17**
2034	3,435	301	491	314	44	1	69	1,472	6,126	**17**
2035	3,486	305	496	320	45	1	68	1,492	6,213	**17**
2036	3,542	309	503	327	45	1	67	1,514	6,308	**17**
2037	3,598	314	509	333	46	1	66	1,537	6,403	**18**
2038	3,654	318	515	339	47	1	66	1,560	6,499	**18**
2039	3,711	323	521	346	47	1	65	1,582	6,595	**18**
2040	3,768	327	527	352	48	1	65	1,605	6,692	**18**
2041	3,829	332	533	359	49	1	64	1,630	6,797	**19**
2042	3,890	337	540	365	49	1	63	1,655	6,901	**19**
2043	3,952	342	547	372	50	1	63	1,680	7,006	**19**
2044	4,013	347	553	379	51	1	62	1,705	7,110	**19**
2045	4,073	352	560	385	51	1	61	1,730	7,214	**20**
2046	4,140	358	567	393	52	1	61	1,757	7,328	**20**
2047	4,206	363	575	400	53	1	60	1,784	7,442	**20**
2048	4,271	369	582	407	54	1	60	1,811	7,554	**21**
2049	4,337	374	589	415	54	1	59	1,838	7,666	**21**
2050	4,402	379	596	422	55	1	58	1,865	7,778	**21**

Rockdale Enhanced Efficiency, Scenario 2

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family Resident	ti Family Reside	Commercial	Institutional	Industrial	Irrigation	Other	Self Supplied	New Commercia	NRW	Total	AADD (MGD)
2015	1,854	209	485	56	84	52	345	229	1	1,366	4,681	**13**
2016	1,877	211	499	57	86	53	349	227	1	1,385	4,745	**13**
2017	1,900	213	509	58	88	55	354	224	1	1,403	4,805	**13**
2018	1,923	215	516	58	90	56	359	221	1	1,421	4,859	**13**
2019	1,945	217	521	59	91	56	363	219	1	1,437	4,910	**13**
2020	1,967	219	526	60	92	57	368	216	1	1,452	4,958	**14**
2021	1,989	220	530	61	93	58	373	213	1	1,466	5,003	**14**
2022	2,010	222	533	62	94	58	377	211	1	1,479	5,047	**14**
2023	2,031	224	537	62	95	59	382	208	1	1,492	5,089	**14**
2024	2,051	225	540	63	95	59	387	206	1	1,503	5,129	**14**
2025	2,069	227	543	64	96	59	391	203	1	1,515	5,168	**14**
2026	2,087	228	545	64	97	60	395	200	1	1,526	5,204	**14**
2027	2,104	229	548	65	97	60	400	198	1	1,536	5,239	**14**
2028	2,121	231	551	66	98	61	404	195	1	1,546	5,274	**14**
2029	2,138	232	554	67	99	61	409	192	1	1,556	5,308	**15**
2030	2,154	233	557	67	99	61	413	190	1	1,566	5,341	**15**
2031	2,167	234	559	68	100	62	417	187	1	1,574	5,369	**15**
2032	2,181	235	562	69	101	62	421	185	1	1,582	5,398	**15**
2033	2,196	236	564	69	101	63	425	182	1	1,591	5,428	**15**
2034	2,211	237	567	70	102	63	429	180	1	1,599	5,459	**15**
2035	2,227	238	569	71	102	63	433	178	1	1,608	5,491	**15**
2036	2,241	239	572	71	103	64	437	175	1	1,616	5,520	**15**
2037	2,256	241	574	72	104	64	440	173	1	1,625	5,549	**15**
2038	2,271	242	577	72	104	64	444	171	1	1,633	5,579	**15**
2039	2,286	243	579	73	105	65	448	169	1	1,642	5,610	**15**
2040	2,301	244	582	74	105	65	451	167	1	1,651	5,641	**15**
2041	2,316	245	584	74	106	66	455	165	1	1,660	5,671	**16**
2042	2,331	246	587	75	107	66	458	163	1	1,668	5,702	**16**
2043	2,346	248	589	75	107	66	462	161	1	1,677	5,732	**16**
2044	2,361	249	592	76	108	67	466	159	1	1,686	5,763	**16**
2045	2,376	250	594	76	108	67	469	157	1	1,695	5,794	**16**
2046	2,391	251	597	77	109	67	473	155	1	1,704	5,825	**16**
2047	2,406	252	599	78	110	68	476	154	1	1,713	5,857	**16**
2048	2,421	253	602	78	110	68	480	152	1	1,722	5,887	**16**
2049	2,436	255	604	79	111	68	483	150	1	1,731	5,918	**16**
2050	2,451	256	607	79	111	69	487	148	1	1,740	5,949	**16**

Attachment 10

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multi Family	Commercial	Industrial	Irrigation	Agricultural	Self Supplied	New Commercial	Anheuser-Busch	NRW	Total (MG)	AADD (MGD)
2015	2,054	228	402	2,156	23	17	212	4	1,872	3,067	**10,035**	**27**
2016	2,136	236	413	2,222	24	17	211	180	1,873	3,189	**10,501**	**29**
2017	2,215	243	421	2,274	25	17	210	320	1,875	3,328	**10,929**	**30**
2018	2,290	250	428	2,313	25	17	210	421	1,878	3,454	**11,286**	**31**
2019	2,361	257	433	2,349	25	17	209	513	1,881	3,558	**11,605**	**32**
2020	2,428	263	439	2,383	26	17	208	597	1,885	3,651	**11,898**	**33**
2021	2,494	270	445	2,420	26	17	208	682	1,891	3,740	**12,192**	**33**
2022	2,557	275	450	2,454	27	18	207	759	1,896	3,825	**12,468**	**34**
2023	2,616	281	456	2,490	27	18	207	842	1,902	3,907	**12,745**	**35**
2024	2,675	286	461	2,525	27	18	207	921	1,908	3,990	**13,017**	**36**
2025	2,731	292	467	2,560	28	18	206	999	1,914	4,072	**13,286**	**36**
2026	2,786	297	473	2,595	28	18	206	1,078	1,920	4,152	**13,551**	**37**
2027	2,840	302	479	2,632	29	18	205	1,161	1,927	4,233	**13,824**	**38**
2028	2,892	307	485	2,670	29	18	205	1,246	1,933	4,315	**14,100**	**39**
2029	2,944	311	491	2,707	29	18	205	1,329	1,940	4,399	**14,373**	**39**
2030	2,995	316	497	2,746	30	18	205	1,413	1,948	4,484	**14,651**	**40**
2031	3,041	320	503	2,782	30	18	204	1,494	1,954	4,561	**14,909**	**41**
2032	3,086	325	509	2,820	31	18	204	1,578	1,961	4,638	**15,170**	**42**
2033	3,131	329	516	2,859	31	18	204	1,660	1,970	4,716	**15,433**	**42**
2034	3,172	332	521	2,894	31	18	203	1,739	1,976	4,789	**15,677**	**43**
2035	3,208	336	527	2,927	32	18	203	1,814	1,982	4,857	**15,903**	**44**
2036	3,245	339	532	2,963	32	18	203	1,893	1,988	4,925	**16,138**	**44**
2037	3,278	342	537	2,995	32	18	202	1,968	1,993	4,992	**16,358**	**45**
2038	3,310	345	543	3,027	33	18	202	2,043	1,998	5,056	**16,574**	**45**
2039	3,340	348	548	3,059	33	19	201	2,113	2,003	5,120	**16,784**	**46**
2040	3,371	351	553	3,094	34	19	201	2,193	2,010	5,185	**17,009**	**47**
2041	3,401	353	559	3,127	34	19	200	2,268	2,015	5,250	**17,226**	**47**
2042	3,428	356	564	3,159	34	19	200	2,341	2,020	5,313	**17,434**	**48**
2043	3,453	358	569	3,191	35	19	199	2,415	2,025	5,374	**17,638**	**48**
2044	3,476	360	574	3,223	35	19	199	2,490	2,030	5,434	**17,840**	**49**
2045	3,499	362	579	3,254	35	19	198	2,564	2,034	5,495	**18,040**	**49**
2046	3,520	364	583	3,284	36	19	198	2,635	2,038	5,554	**18,231**	**50**
2047	3,542	366	588	3,315	36	19	197	2,707	2,043	5,613	**18,424**	**50**
2048	3,563	368	593	3,344	36	19	196	2,774	2,047	5,672	**18,612**	**51**
2049	3,584	370	597	3,374	37	19	196	2,844	2,052	5,729	**18,802**	**52**
2050	3,605	371	602	3,403	37	19	195	2,915	2,056	5,787	**18,991**	**52**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)												
	Single Family	Multifamily	Commercial	Institutional	Industrial	Irrigation	Agricultural	Other	Self Supplied	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	4,050	577	251	51	229	257	102	155	374	1	1,214	**7,261**	**20**
2016	4,171	591	259	53	238	267	102	160	372	1	1,251	**7,464**	**20**
2017	4,293	606	266	54	246	276	102	165	369	1	1,286	**7,663**	**21**
2018	4,416	621	271	56	252	283	102	170	367	1	1,319	**7,856**	**22**
2019	4,537	635	276	57	257	289	102	175	365	1	1,351	**8,045**	**22**
2020	4,657	649	280	59	262	294	102	180	362	1	1,382	**8,229**	**23**
2021	4,778	663	284	61	267	300	103	185	361	1	1,414	**8,416**	**23**
2022	4,894	677	288	62	272	305	103	190	359	1	1,444	**8,594**	**24**
2023	5,009	690	291	64	276	310	103	195	357	1	1,473	**8,768**	**24**
2024	5,122	703	294	65	280	314	104	200	355	1	1,503	**8,941**	**24**
2025	5,235	716	298	67	285	319	104	205	353	1	1,532	**9,113**	**25**
2026	5,346	729	302	69	289	324	104	210	350	1	1,560	**9,284**	**25**
2027	5,460	742	306	70	294	330	105	215	348	1	1,590	**9,459**	**26**
2028	5,574	755	310	72	299	335	105	220	346	1	1,619	**9,635**	**26**
2029	5,688	767	314	74	304	341	105	225	344	1	1,649	**9,812**	**27**
2030	5,806	781	319	76	309	347	106	231	342	1	1,680	**9,997**	**27**
2031	5,917	793	323	77	314	352	106	236	340	1	1,709	**10,167**	**28**
2032	6,029	805	327	79	319	358	107	241	338	1	1,737	**10,342**	**28**
2033	6,143	818	332	81	325	364	107	246	336	1	1,766	**10,519**	**29**
2034	6,252	830	336	82	330	370	107	251	334	1	1,794	**10,689**	**29**
2035	6,356	842	341	84	335	376	108	256	332	1	1,821	**10,852**	**30**
2036	6,463	854	345	86	340	382	108	261	331	1	1,848	**11,019**	**30**
2037	6,565	866	349	87	345	388	108	266	329	1	1,875	**11,179**	**31**
2038	6,666	877	353	89	350	393	109	270	327	1	1,901	**11,336**	**31**
2039	6,767	888	358	90	355	399	109	275	325	1	1,927	**11,494**	**31**
2040	6,869	900	362	92	361	405	109	279	324	1	1,953	**11,655**	**32**
2041	6,967	911	364	93	363	407	110	284	322	1	1,979	**11,801**	**32**
2042	7,061	922	366	94	366	410	110	288	320	1	2,002	**11,940**	**33**
2043	7,150	932	368	96	369	414	110	292	319	1	2,024	**12,073**	**33**
2044	7,234	941	370	97	372	417	110	296	317	1	2,045	**12,200**	**33**
2045	7,315	950	372	98	374	420	111	300	315	1	2,065	**12,322**	**34**
2046	7,391	959	374	99	377	423	111	303	314	1	2,084	**12,435**	**34**
2047	7,464	967	376	101	379	426	111	307	312	1	2,102	**12,545**	**34**
2048	7,534	974	377	102	381	428	111	310	310	1	2,120	**12,649**	**35**
2049	7,601	982	378	103	383	430	111	314	309	1	2,136	**12,747**	**35**
2050	7,664	988	378	104	384	431	112	317	307	1	2,151	**12,836**	**35**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Agricultural	Other	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	4,048	1,867	1,024	424	858	0	20	1	891	**9,133**	**25**
2016	4,067	1,875	1,022	435	864	0	20	154	898	**9,336**	**26**
2017	4,091	1,886	1,020	444	873	0	21	276	919	**9,529**	**26**
2018	4,118	1,897	1,018	450	882	0	21	362	939	**9,688**	**27**
2019	4,147	1,910	1,017	457	891	0	21	439	955	**9,837**	**27**
2020	4,176	1,922	1,016	462	901	0	22	504	970	**9,973**	**27**
2021	4,208	1,936	1,017	468	912	0	22	567	984	**10,114**	**28**
2022	4,236	1,948	1,017	473	922	0	22	623	998	**10,239**	**28**
2023	4,261	1,959	1,017	478	931	0	22	666	1,009	**10,343**	**28**
2024	4,283	1,968	1,018	482	941	0	23	708	1,019	**10,440**	**29**
2025	4,303	1,977	1,018	486	950	0	23	753	1,028	**10,538**	**29**
2026	4,322	1,985	1,019	491	958	0	23	797	1,038	**10,632**	**29**
2027	4,342	1,993	1,020	496	968	0	23	845	1,047	**10,734**	**29**
2028	4,362	2,002	1,021	501	977	0	23	897	1,058	**10,841**	**30**
2029	4,384	2,011	1,022	506	988	0	24	950	1,069	**10,953**	**30**
2030	4,410	2,022	1,024	512	999	0	24	1,005	1,081	**11,077**	**30**
2031	4,431	2,031	1,025	517	1,009	0	24	1,060	1,092	**11,189**	**31**
2032	4,456	2,042	1,026	523	1,020	0	25	1,117	1,103	**11,313**	**31**
2033	4,484	2,054	1,028	529	1,032	0	25	1,178	1,116	**11,447**	**31**
2034	4,512	2,066	1,030	535	1,043	0	25	1,237	1,129	**11,575**	**32**
2035	4,537	2,077	1,030	540	1,053	0	25	1,296	1,140	**11,699**	**32**
2036	4,567	2,090	1,031	546	1,064	0	26	1,356	1,153	**11,833**	**32**
2037	4,595	2,102	1,032	551	1,075	0	26	1,414	1,166	**11,960**	**33**
2038	4,623	2,114	1,032	556	1,086	0	26	1,471	1,178	**12,087**	**33**
2039	4,654	2,128	1,032	562	1,097	0	26	1,528	1,191	**12,219**	**33**
2040	4,688	2,142	1,033	568	1,108	0	27	1,592	1,204	**12,363**	**34**
2041	4,721	2,157	1,034	573	1,119	0	27	1,655	1,218	**12,505**	**34**
2042	4,753	2,171	1,035	579	1,130	0	27	1,714	1,232	**12,641**	**35**
2043	4,784	2,184	1,035	584	1,141	0	27	1,776	1,245	**12,778**	**35**
2044	4,815	2,198	1,035	590	1,152	0	28	1,838	1,258	**12,913**	**35**
2045	4,845	2,211	1,035	595	1,162	0	28	1,902	1,271	**13,051**	**36**
2046	4,875	2,224	1,035	600	1,173	0	28	1,963	1,284	**13,182**	**36**
2047	4,904	2,237	1,035	606	1,183	0	28	2,026	1,297	**13,317**	**36**
2048	4,934	2,250	1,035	611	1,193	0	29	2,088	1,311	**13,451**	**37**
2049	4,964	2,263	1,035	617	1,204	0	29	2,149	1,324	**13,585**	**37**
2050	4,993	2,275	1,035	622	1,214	0	29	2,211	1,336	**13,717**	**38**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	12,814	3,713	5,355	699	401	0	799	1	1	2,246	**26,029**	**71**
2016	12,815	3,711	5,495	701	414	0	823	1	1	2,252	**26,213**	**72**
2017	12,842	3,717	5,608	705	424	0	844	1	1	2,273	**26,414**	**72**
2018	12,887	3,728	5,693	710	432	0	859	1	1	2,294	**26,605**	**73**
2019	12,945	3,743	5,770	715	439	0	873	1	1	2,314	**26,801**	**73**
2020	13,013	3,761	5,838	722	445	0	886	1	1	2,333	**26,998**	**74**
2021	13,097	3,783	5,908	729	452	0	898	1	1	2,353	**27,223**	**75**
2022	13,180	3,805	5,968	737	457	0	910	1	1	2,373	**27,432**	**75**
2023	13,269	3,828	6,031	745	463	0	921	1	1	2,393	**27,652**	**76**
2024	13,367	3,854	6,098	754	469	0	933	1	1	2,414	**27,891**	**76**
2025	13,473	3,881	6,167	763	475	0	946	1	1	2,437	**28,144**	**77**
2026	13,584	3,910	6,233	773	481	0	958	1	1	2,460	**28,402**	**78**
2027	13,705	3,942	6,304	784	488	0	971	1	1	2,485	**28,680**	**79**
2028	13,833	3,976	6,380	796	495	0	985	1	1	2,510	**28,976**	**79**
2029	13,969	4,011	6,456	808	502	0	998	1	1	2,538	**29,283**	**80**
2030	14,119	4,051	6,534	821	509	0	1,012	1	1	2,567	**29,614**	**81**
2031	14,254	4,086	6,610	833	515	0	1,026	1	1	2,593	**29,919**	**82**
2032	14,399	4,124	6,688	846	522	0	1,040	1	1	2,621	**30,241**	**83**
2033	14,555	4,166	6,772	859	530	0	1,054	1	1	2,650	**30,588**	**84**
2034	14,706	4,206	6,851	872	537	0	1,068	1	1	2,678	**30,920**	**85**
2035	14,851	4,244	6,928	884	544	0	1,082	1	1	2,705	**31,241**	**86**
2036	15,007	4,286	7,008	897	551	0	1,097	1	1	2,734	**31,582**	**87**
2037	15,156	4,326	7,085	909	558	0	1,110	1	1	2,762	**31,908**	**87**
2038	15,305	4,367	7,159	922	565	0	1,124	1	1	2,790	**32,232**	**88**
2039	15,459	4,408	7,235	934	572	0	1,137	1	1	2,818	**32,564**	**89**
2040	15,618	4,452	7,317	946	579	0	1,152	1	1	2,847	**32,913**	**90**
2041	15,773	4,494	7,394	959	586	0	1,166	1	1	2,876	**33,250**	**91**
2042	15,920	4,534	7,471	971	593	0	1,180	1	1	2,904	**33,574**	**92**
2043	16,061	4,572	7,545	982	600	0	1,193	1	1	2,930	**33,884**	**93**
2044	16,194	4,608	7,618	993	606	0	1,207	1	1	2,956	**34,183**	**94**
2045	16,322	4,643	7,690	1,003	613	0	1,220	1	1	2,980	**34,474**	**94**
2046	16,443	4,675	7,761	1,013	619	0	1,233	1	1	3,004	**34,751**	**95**
2047	16,561	4,707	7,831	1,023	626	0	1,246	1	1	3,027	**35,023**	**96**
2048	16,675	4,738	7,901	1,033	632	0	1,258	1	1	3,050	**35,289**	**97**
2049	16,784	4,767	7,970	1,042	639	0	1,271	1	1	3,072	**35,547**	**97**
2050	16,885	4,794	8,037	1,051	645	0	1,284	1	1	3,093	**35,791**	**98**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercial	Self-Supplied	NRW	Total (MG)	AADD (MGD)
2015	2,290	328	508	68	313	379	186	0	415	496	**4,984**	**14**
2016	2,380	338	524	71	323	393	193	0	411	513	**5,145**	**14**
2017	2,468	347	537	73	332	406	198	0	406	529	**5,297**	**15**
2018	2,554	357	547	75	339	419	202	0	402	544	**5,439**	**15**
2019	2,638	366	557	78	346	432	206	0	397	558	**5,578**	**15**
2020	2,719	375	565	80	352	445	210	0	393	571	**5,710**	**16**
2021	2,800	384	574	82	359	458	213	0	389	584	**5,844**	**16**
2022	2,878	392	583	85	364	470	217	0	385	597	**5,973**	**16**
2023	2,954	401	590	87	370	483	220	0	382	610	**6,095**	**17**
2024	3,027	409	598	89	375	495	223	0	378	622	**6,215**	**17**
2025	3,099	416	605	91	380	507	226	0	374	633	**6,333**	**17**
2026	3,169	424	613	93	386	520	229	0	370	645	**6,448**	**18**
2027	3,239	432	621	96	391	532	233	0	366	656	**6,565**	**18**
2028	3,308	439	629	98	397	544	236	0	362	668	**6,682**	**18**
2029	3,376	446	638	100	403	557	240	0	358	680	**6,798**	**19**
2030	3,446	454	647	102	409	569	244	0	355	692	**6,918**	**19**
2031	3,510	461	655	105	415	581	247	0	351	702	**7,028**	**19**
2032	3,575	468	664	107	421	593	251	0	347	713	**7,140**	**20**
2033	3,640	475	674	109	428	605	255	0	344	724	**7,253**	**20**
2034	3,701	481	682	111	434	617	258	0	340	735	**7,359**	**20**
2035	3,759	488	690	113	439	627	261	0	337	744	**7,458**	**20**
2036	3,817	494	699	115	445	638	265	0	333	754	**7,559**	**21**
2037	3,872	500	707	116	451	647	268	0	330	763	**7,654**	**21**
2038	3,924	505	714	118	456	657	271	0	326	772	**7,746**	**21**
2039	3,977	511	722	120	461	667	275	0	323	781	**7,837**	**21**
2040	4,030	517	730	122	467	676	278	0	320	790	**7,930**	**22**
2041	4,081	522	738	123	473	685	282	0	317	799	**8,019**	**22**
2042	4,128	527	746	125	478	694	285	0	314	807	**8,103**	**22**
2043	4,173	532	753	126	483	702	288	0	311	815	**8,183**	**22**
2044	4,215	536	761	128	489	709	291	0	308	823	**8,259**	**23**
2045	4,256	540	768	129	494	717	294	0	305	830	**8,333**	**23**
2046	4,295	544	775	130	499	724	297	0	301	837	**8,402**	**23**
2047	4,332	548	782	131	504	731	300	0	298	844	**8,471**	**23**
2048	4,369	552	789	133	509	738	303	0	295	850	**8,538**	**23**
2049	4,405	556	796	134	514	745	306	0	293	857	**8,604**	**24**
2050	4,439	559	802	135	519	751	309	0	290	863	**8,667**	**24**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	Apt/Condo (MFR)	Commercial	Institutional (SCH)	Municipal (GOV)	Other	Irrigation	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	11,029	3,945	5,013	233	140	27	662	1	5,579	**26,628**	**73**
2016	11,023	3,938	5,121	234	140	27	679	1	5,592	**26,755**	**73**
2017	11,034	3,938	5,208	235	141	27	693	1	5,630	**26,907**	**74**
2018	11,058	3,942	5,270	236	142	27	703	1	5,670	**27,049**	**74**
2019	11,091	3,949	5,327	238	143	28	713	1	5,706	**27,195**	**75**
2020	11,132	3,959	5,381	240	144	28	722	1	5,741	**27,346**	**75**
2021	11,188	3,973	5,440	242	145	28	731	1	5,782	**27,531**	**75**
2022	11,246	3,988	5,495	244	147	28	740	1	5,823	**27,712**	**76**
2023	11,307	4,004	5,549	247	148	29	749	1	5,864	**27,897**	**76**
2024	11,374	4,021	5,603	249	150	29	758	1	5,908	**28,093**	**77**
2025	11,447	4,040	5,659	252	152	29	767	1	5,953	**28,300**	**78**
2026	11,523	4,060	5,713	255	153	30	776	1	6,000	**28,511**	**78**
2027	11,606	4,082	5,770	258	155	30	785	1	6,049	**28,738**	**79**
2028	11,695	4,106	5,832	262	157	30	795	1	6,101	**28,978**	**79**
2029	11,788	4,131	5,892	265	160	31	805	1	6,155	**29,227**	**80**
2030	11,893	4,159	5,955	269	162	31	815	1	6,214	**29,499**	**81**
2031	11,983	4,182	6,015	273	164	32	825	1	6,264	**29,739**	**81**
2032	12,082	4,209	6,077	277	166	32	835	1	6,316	**29,994**	**82**
2033	12,189	4,239	6,145	281	169	33	845	1	6,372	**30,274**	**83**
2034	12,292	4,268	6,209	284	171	33	856	1	6,426	**30,540**	**84**
2035	12,390	4,295	6,271	288	173	33	866	1	6,478	**30,795**	**84**
2036	12,498	4,326	6,336	292	175	34	876	1	6,535	**31,073**	**85**
2037	12,601	4,355	6,397	295	177	34	886	1	6,590	**31,337**	**86**
2038	12,705	4,385	6,457	299	180	35	896	1	6,645	**31,602**	**87**
2039	12,814	4,418	6,517	302	182	35	905	1	6,702	**31,877**	**87**
2040	12,931	4,452	6,586	306	184	36	916	1	6,762	**32,175**	**88**
2041	13,046	4,486	6,651	310	186	36	927	1	6,823	**32,467**	**89**
2042	13,157	4,519	6,715	314	189	36	937	1	6,882	**32,750**	**90**
2043	13,265	4,551	6,779	317	191	37	947	1	6,939	**33,027**	**90**
2044	13,369	4,582	6,843	321	193	37	958	1	6,995	**33,297**	**91**
2045	13,471	4,612	6,906	324	195	38	968	1	7,051	**33,565**	**92**
2046	13,569	4,640	6,969	327	197	38	978	1	7,104	**33,825**	**93**
2047	13,667	4,669	7,033	331	199	38	989	1	7,158	**34,084**	**93**
2048	13,763	4,696	7,097	334	201	39	999	1	7,212	**34,342**	**94**
2049	13,856	4,723	7,161	337	203	39	1,009	1	7,264	**34,594**	**95**
2050	13,944	4,748	7,223	340	205	40	1,020	1	7,314	**34,835**	**95**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	2,342	560	384	80	116	190	88	0	922	**4,683**	**13**
2016	2,371	566	396	81	121	193	91	0	936	**4,756**	**13**
2017	2,402	573	405	82	124	197	94	0	952	**4,831**	**13**
2018	2,436	581	413	84	127	200	96	0	968	**4,905**	**13**
2019	2,470	588	420	85	130	204	98	0	983	**4,979**	**14**
2020	2,506	596	426	87	133	208	100	0	998	**5,054**	**14**
2021	2,544	604	432	89	135	212	102	0	1,014	**5,133**	**14**
2022	2,581	613	438	90	138	216	104	0	1,030	**5,210**	**14**
2023	2,619	621	444	92	140	220	106	0	1,045	**5,287**	**14**
2024	2,657	629	449	94	142	224	107	0	1,061	**5,364**	**15**
2025	2,695	637	455	96	144	229	109	0	1,076	**5,442**	**15**
2026	2,734	645	460	98	146	233	111	0	1,092	**5,520**	**15**
2027	2,774	654	466	100	149	238	112	0	1,108	**5,601**	**15**
2028	2,814	663	473	102	151	243	114	0	1,125	**5,684**	**16**
2029	2,855	671	479	104	154	248	116	0	1,142	**5,769**	**16**
2030	2,899	681	486	106	156	253	118	0	1,159	**5,858**	**16**
2031	2,939	689	492	108	159	258	120	0	1,175	**5,940**	**16**
2032	2,980	698	499	110	161	263	122	0	1,192	**6,024**	**17**
2033	3,023	707	505	112	164	268	124	0	1,208	**6,111**	**17**
2034	3,063	715	512	114	166	273	126	0	1,224	**6,194**	**17**
2035	3,102	724	518	116	169	277	128	0	1,240	**6,273**	**17**
2036	3,142	732	525	118	172	282	130	0	1,256	**6,356**	**17**
2037	3,180	741	531	120	174	286	131	0	1,271	**6,434**	**18**
2038	3,218	749	537	122	176	291	133	0	1,286	**6,511**	**18**
2039	3,256	757	543	123	179	295	135	0	1,301	**6,589**	**18**
2040	3,295	765	549	125	181	299	137	0	1,316	**6,669**	**18**
2041	3,332	773	555	127	184	304	139	0	1,331	**6,746**	**18**
2042	3,368	781	561	129	186	308	140	0	1,346	**6,819**	**19**
2043	3,402	788	567	131	188	312	142	0	1,359	**6,889**	**19**
2044	3,434	795	572	132	190	316	144	0	1,372	**6,956**	**19**
2045	3,465	802	577	134	193	319	146	0	1,385	**7,021**	**19**
2046	3,494	808	583	135	195	323	147	0	1,397	**7,082**	**19**
2047	3,522	814	588	137	197	326	149	0	1,409	**7,141**	**20**
2048	3,550	820	592	138	199	329	150	0	1,420	**7,199**	**20**
2049	3,576	825	597	139	201	333	152	0	1,431	**7,254**	**20**
2050	3,600	830	602	141	203	336	153	0	1,441	**7,306**	**20**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total (MG)	AADD (MGD)
2015	2,477	160	455	57	30	84	200	490	341	**4,295**	**12**
2016	2,483	160	467	59	30	86	200	485	342	**4,312**	**12**
2017	2,497	161	477	61	30	89	201	480	344	**4,338**	**12**
2018	2,516	161	484	62	30	90	202	475	347	**4,368**	**12**
2019	2,542	162	491	63	31	92	204	470	350	**4,404**	**12**
2020	2,570	163	497	64	31	93	207	465	353	**4,444**	**12**
2021	2,604	165	503	65	31	95	209	461	357	**4,491**	**12**
2022	2,641	166	509	66	32	96	212	457	361	**4,540**	**12**
2023	2,679	168	514	67	32	97	215	452	366	**4,591**	**13**
2024	2,721	170	519	68	33	99	218	448	370	**4,645**	**13**
2025	2,764	172	524	68	33	100	222	443	375	**4,701**	**13**
2026	2,809	173	529	69	34	101	225	439	379	**4,760**	**13**
2027	2,858	176	535	70	34	102	229	435	385	**4,825**	**13**
2028	2,910	178	541	71	35	104	234	430	390	**4,893**	**13**
2029	2,965	180	547	72	36	105	238	426	396	**4,965**	**14**
2030	3,022	183	554	73	37	107	243	422	402	**5,043**	**14**
2031	3,077	185	560	74	37	108	248	418	408	**5,114**	**14**
2032	3,132	188	566	75	38	110	252	414	414	**5,188**	**14**
2033	3,188	190	572	76	39	111	257	410	420	**5,263**	**14**
2034	3,242	193	578	77	39	112	261	406	425	**5,333**	**15**
2035	3,291	195	584	78	40	114	265	402	430	**5,398**	**15**
2036	3,340	197	590	79	40	115	269	398	435	**5,464**	**15**
2037	3,387	199	595	80	41	116	273	394	440	**5,525**	**15**
2038	3,430	201	601	81	42	118	276	391	444	**5,584**	**15**
2039	3,474	203	606	82	42	119	280	387	449	**5,641**	**15**
2040	3,516	205	613	83	43	121	283	383	453	**5,699**	**16**
2041	3,556	206	619	84	43	122	287	380	458	**5,754**	**16**
2042	3,592	208	624	84	43	123	290	376	461	**5,802**	**16**
2043	3,625	209	630	85	44	125	292	373	465	**5,847**	**16**
2044	3,654	210	635	86	44	126	295	369	468	**5,889**	**16**
2045	3,682	212	640	87	45	127	297	366	471	**5,926**	**16**
2046	3,706	213	645	88	45	128	299	362	474	**5,961**	**16**
2047	3,730	213	651	89	45	130	301	359	476	**5,993**	**16**
2048	3,752	214	656	90	45	131	303	355	479	**6,024**	**17**
2049	3,772	215	661	90	46	132	305	352	481	**6,054**	**17**
2050	3,792	216	666	91	46	133	306	348	483	**6,082**	**17**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	Commercial	Industrial	Municipal	Irrigation	Other	New Commercial	Self Supplied	NRW	Total (MG)	AADD (MGD)
2015	4,423	933	467	63	259	37	1	198	1,886	**8,267**	**23**
2016	4,611	967	486	66	269	39	1	197	1,972	**8,606**	**24**
2017	4,803	995	501	69	278	41	1	195	2,051	**8,933**	**24**
2018	5,000	1,017	514	72	285	43	1	193	2,128	**9,251**	**25**
2019	5,201	1,038	526	75	291	44	1	192	2,202	**9,569**	**26**
2020	5,405	1,057	536	78	297	46	1	190	2,276	**9,887**	**27**
2021	5,615	1,077	548	81	304	48	1	189	2,351	**10,214**	**28**
2022	5,823	1,098	559	84	310	50	1	187	2,425	**10,537**	**29**
2023	6,031	1,117	570	88	316	52	1	186	2,499	**10,859**	**30**
2024	6,240	1,137	581	91	322	54	1	185	2,573	**11,184**	**31**
2025	6,449	1,157	592	95	328	56	1	183	2,647	**11,508**	**32**
2026	6,657	1,176	603	98	334	58	1	182	2,721	**11,830**	**32**
2027	6,865	1,198	615	101	341	60	1	181	2,795	**12,157**	**33**
2028	7,073	1,219	627	105	348	62	1	180	2,869	**12,484**	**34**
2029	7,281	1,241	639	109	354	65	1	179	2,944	**12,812**	**35**
2030	7,492	1,264	652	112	361	67	1	178	3,020	**13,146**	**36**
2031	7,685	1,286	664	116	368	69	1	176	3,090	**13,455**	**37**
2032	7,875	1,309	676	119	375	71	1	175	3,157	**13,758**	**38**
2033	8,061	1,331	689	122	382	73	1	174	3,224	**14,056**	**39**
2034	8,233	1,353	701	125	389	74	1	173	3,285	**14,334**	**39**
2035	8,391	1,374	713	128	395	76	1	172	3,343	**14,592**	**40**
2036	8,547	1,396	725	131	402	78	1	171	3,400	**14,849**	**41**
2037	8,692	1,416	737	133	408	79	1	169	3,453	**15,089**	**41**
2038	8,831	1,437	748	135	415	81	1	168	3,505	**15,321**	**42**
2039	8,967	1,458	760	138	421	82	1	167	3,556	**15,550**	**43**
2040	9,100	1,480	772	140	428	83	1	166	3,607	**15,777**	**43**
2041	9,224	1,503	785	142	435	85	1	164	3,655	**15,995**	**44**
2042	9,338	1,525	798	144	442	86	1	163	3,701	**16,199**	**44**
2043	9,443	1,548	810	146	449	87	1	162	3,743	**16,390**	**45**
2044	9,538	1,570	823	148	456	88	1	161	3,783	**16,568**	**45**
2045	9,624	1,593	836	150	463	89	1	159	3,820	**16,735**	**46**
2046	9,700	1,617	849	151	471	90	1	158	3,854	**16,891**	**46**
2047	9,769	1,642	864	152	479	91	1	157	3,887	**17,042**	**47**
2048	9,831	1,671	880	154	488	91	1	156	3,919	**17,189**	**47**
2049	9,885	1,704	898	155	498	92	1	154	3,949	**17,336**	**47**
2050	9,930	1,742	919	156	510	93	1	153	3,979	**17,481**	**48**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total (MG)	AADD (MGD)
2015	15,030	8,618	13,358	239	637	803	55	177	239	12,919	**52,075**	**143**
2016	15,128	8,668	13,648	242	652	810	56	179	237	13,042	**52,663**	**144**
2017	15,232	8,722	13,871	244	665	819	57	181	235	13,198	**53,223**	**146**
2018	15,340	8,777	14,023	247	674	827	58	183	233	13,341	**53,702**	**147**
2019	15,446	8,832	14,159	249	681	836	59	185	231	13,462	**54,140**	**148**
2020	15,551	8,886	14,276	252	688	844	59	186	229	13,571	**54,543**	**149**
2021	15,668	8,946	14,407	255	696	854	60	189	228	13,683	**54,984**	**151**
2022	15,775	9,001	14,523	257	703	863	60	191	226	13,788	**55,387**	**152**
2023	15,882	9,056	14,653	260	710	872	61	193	224	13,891	**55,803**	**153**
2024	15,994	9,114	14,790	263	718	882	62	195	223	14,002	**56,244**	**154**
2025	16,109	9,173	14,930	266	726	893	62	197	221	14,117	**56,695**	**155**
2026	16,224	9,232	15,059	269	733	903	63	199	220	14,232	**57,134**	**157**
2027	16,344	9,294	15,196	273	741	914	64	202	218	14,348	**57,593**	**158**
2028	16,467	9,357	15,348	276	749	926	64	204	217	14,468	**58,076**	**159**
2029	16,592	9,421	15,492	280	757	938	65	207	216	14,592	**58,559**	**160**
2030	16,726	9,491	15,638	283	765	950	66	210	214	14,722	**59,066**	**162**
2031	16,839	9,548	15,778	287	773	962	67	212	213	14,830	**59,509**	**163**
2032	16,960	9,610	15,918	290	781	973	67	215	211	14,941	**59,967**	**164**
2033	17,091	9,679	16,080	294	790	985	68	217	210	15,060	**60,475**	**166**
2034	17,214	9,742	16,229	297	798	996	69	220	209	15,173	**60,947**	**167**
2035	17,327	9,800	16,371	300	806	1,007	69	222	207	15,279	**61,390**	**168**
2036	17,452	9,865	16,522	303	815	1,018	70	225	206	15,396	**61,871**	**170**
2037	17,569	9,925	16,664	307	823	1,028	71	227	204	15,505	**62,322**	**171**
2038	17,685	9,985	16,804	310	831	1,038	71	229	203	15,614	**62,770**	172
2039	17,808	10,049	16,944	313	839	1,048	72	231	201	15,728	**63,234**	**173**
2040	17,938	10,117	17,106	316	848	1,059	73	234	200	15,849	**63,740**	**175**
2041	18,065	10,183	17,258	319	856	1,070	74	236	199	15,968	**64,227**	**176**
2042	18,184	10,246	17,407	322	865	1,079	74	238	197	16,083	**64,695**	**177**
2043	18,298	10,305	17,552	325	873	1,089	75	240	196	16,192	**65,144**	**178**
2044	18,406	10,360	17,695	328	881	1,098	76	242	194	16,298	**65,579**	**180**
2045	18,512	10,415	17,839	330	889	1,107	77	244	192	16,403	**66,008**	**181**
2046	18,610	10,465	17,981	333	897	1,116	77	246	191	16,503	**66,419**	**182**
2047	18,708	10,515	18,125	335	905	1,124	78	248	189	16,604	**66,832**	**183**
2048	18,804	10,564	18,269	338	913	1,133	79	250	188	16,705	**67,242**	**184**
2049	18,896	10,611	18,415	340	922	1,141	79	252	186	16,803	**67,646**	**185**
2050	18,981	10,653	18,559	343	930	1,149	80	254	185	16,897	**68,031**	**186**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	15,476	4,173	3,277	424	196	280	776	1,248	1	4,960	**30,812**	**84**
2016	15,623	4,212	3,375	439	203	284	803	1,264	1	5,024	**31,227**	**86**
2017	15,788	4,256	3,457	451	208	288	825	1,282	1	5,097	**31,653**	**87**
2018	15,962	4,302	3,520	461	213	292	843	1,301	1	5,171	**32,066**	**88**
2019	16,145	4,351	3,580	470	217	296	860	1,321	1	5,241	**32,482**	**89**
2020	16,334	4,401	3,632	478	221	301	875	1,342	1	5,311	**32,896**	**90**
2021	16,542	4,456	3,687	487	225	306	890	1,364	1	5,385	**33,342**	**91**
2022	16,746	4,510	3,735	494	228	311	904	1,387	1	5,457	**33,773**	**93**
2023	16,954	4,565	3,783	501	231	316	917	1,410	1	5,529	**34,209**	**94**
2024	17,170	4,623	3,831	509	235	322	931	1,435	1	5,603	**34,659**	**95**
2025	17,392	4,681	3,881	517	238	328	945	1,461	1	5,679	**35,122**	**96**
2026	17,618	4,741	3,929	524	242	333	958	1,487	1	5,756	**35,589**	**98**
2027	17,853	4,803	3,980	532	245	340	973	1,515	1	5,836	**36,076**	**99**
2028	18,096	4,867	4,033	540	249	346	987	1,543	1	5,918	**36,581**	**100**
2029	18,348	4,933	4,087	548	253	353	1,002	1,573	1	6,003	**37,101**	**102**
2030	18,616	5,003	4,142	556	257	360	1,018	1,605	1	6,093	**37,650**	**103**
2031	18,864	5,068	4,195	564	261	367	1,032	1,635	1	6,176	**38,163**	**105**
2032	19,124	5,137	4,249	573	264	374	1,047	1,666	1	6,260	**38,695**	**106**
2033	19,399	5,209	4,307	581	268	381	1,063	1,698	1	6,349	**39,258**	**108**
2034	19,666	5,280	4,361	589	272	388	1,078	1,729	1	6,435	**39,799**	**109**
2035	19,925	5,348	4,412	597	276	395	1,093	1,759	1	6,518	**40,323**	**110**
2036	20,198	5,420	4,467	606	280	401	1,108	1,790	1	6,606	**40,876**	**112**
2037	20,463	5,490	4,519	614	283	408	1,123	1,820	1	6,691	**41,411**	**113**
2038	20,729	5,560	4,572	622	287	415	1,137	1,850	1	6,776	**41,949**	**115**
2039	21,003	5,632	4,624	630	291	422	1,152	1,881	1	6,864	**42,499**	**116**
2040	21,287	5,707	4,681	639	295	429	1,168	1,912	1	6,955	**43,073**	**118**
2041	21,566	5,781	4,737	647	299	436	1,183	1,943	1	7,046	**43,637**	**120**
2042	21,837	5,852	4,790	655	302	442	1,199	1,973	1	7,133	**44,186**	**121**
2043	22,102	5,922	4,842	663	306	449	1,213	2,002	1	7,219	**44,720**	**123**
2044	22,359	5,990	4,894	671	310	455	1,228	2,031	1	7,303	**45,242**	**124**
2045	22,613	6,057	4,945	679	314	462	1,242	2,060	1	7,386	**45,758**	**125**
2046	22,859	6,121	4,994	687	317	468	1,256	2,088	1	7,466	**46,256**	**127**
2047	23,103	6,185	5,043	695	321	474	1,270	2,115	1	7,545	**46,752**	**128**
2048	23,346	6,249	5,092	702	324	481	1,285	2,143	1	7,625	**47,247**	**129**
2049	23,584	6,311	5,140	710	328	487	1,298	2,171	1	7,703	**47,733**	**131**
2050	23,815	6,372	5,188	717	331	493	1,312	2,197	1	7,779	**48,205**	**132**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Irrigation	Other	New Commercial	Self Supplied	NRW	Total (MG)	AADD (MGD)
2015	2,535	466	726	1,860	113	30	0	537	1,121	**7,389**	**20**
2016	2,638	479	746	1,918	117	31	0	531	1,161	**7,621**	**21**
2017	2,737	492	762	1,966	120	32	0	525	1,195	**7,828**	**21**
2018	2,831	504	774	2,001	122	33	0	519	1,225	**8,010**	**22**
2019	2,922	516	785	2,036	124	34	0	513	1,251	**8,181**	**22**
2020	3,009	527	796	2,067	126	35	0	507	1,276	**8,343**	**23**
2021	3,095	538	807	2,101	128	36	0	502	1,301	**8,508**	**23**
2022	3,177	549	817	2,132	130	37	0	497	1,324	**8,663**	**24**
2023	3,258	559	828	2,165	132	38	0	492	1,347	**8,819**	**24**
2024	3,336	569	839	2,198	134	39	0	486	1,371	**8,972**	**25**
2025	3,413	579	850	2,231	136	39	0	481	1,394	**9,123**	**25**
2026	3,489	588	861	2,263	138	40	0	476	1,416	**9,272**	**25**
2027	3,565	598	873	2,298	140	41	0	470	1,439	**9,424**	**26**
2028	3,640	607	884	2,332	142	42	0	465	1,462	**9,576**	**26**
2029	3,715	616	896	2,366	144	43	0	460	1,485	**9,727**	**27**
2030	3,792	626	908	2,402	146	44	0	455	1,509	**9,883**	**27**
2031	3,862	634	920	2,436	148	45	0	449	1,531	**10,026**	**27**
2032	3,932	643	931	2,470	150	46	0	444	1,552	**10,170**	**28**
2033	4,004	652	943	2,505	152	47	0	440	1,574	**10,317**	**28**
2034	4,071	660	954	2,539	154	48	0	435	1,594	**10,456**	**29**
2035	4,135	668	965	2,570	156	49	0	430	1,613	**10,587**	**29**
2036	4,199	676	976	2,603	158	49	0	426	1,633	**10,721**	**29**
2037	4,260	683	986	2,634	160	50	0	421	1,652	**10,848**	**30**
2038	4,320	691	996	2,665	162	51	0	416	1,671	**10,973**	**30**
2039	4,380	698	1,007	2,696	164	52	0	412	1,689	**11,099**	**30**
2040	4,441	706	1,018	2,730	166	52	0	408	1,709	**11,230**	**31**
2041	4,499	713	1,029	2,764	168	53	0	404	1,728	**11,358**	**31**
2042	4,555	720	1,040	2,795	170	54	0	400	1,746	**11,479**	**31**
2043	4,609	726	1,050	2,827	172	54	0	396	1,764	**11,598**	**32**
2044	4,660	733	1,061	2,858	174	55	0	392	1,781	**11,714**	**32**
2045	4,711	739	1,071	2,890	176	56	0	388	1,798	**11,828**	**32**
2046	4,759	744	1,081	2,921	178	56	0	384	1,815	**11,938**	**33**
2047	4,807	750	1,092	2,952	180	57	0	380	1,831	**12,048**	**33**
2048	4,855	756	1,102	2,983	181	58	0	376	1,848	**12,159**	**33**
2049	4,902	762	1,113	3,015	183	58	0	372	1,865	**12,270**	**34**
2050	4,947	767	1,123	3,047	185	59	0	368	1,881	**12,378**	**34**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self Supplied	New Commercial	NRW	Total (MG)	AADD (MGD)
2015	4,192	807	615	144	9	206	210	301	1	2,153	**8,637**	**24**
2016	4,323	829	633	148	9	212	217	298	1	2,222	**8,891**	**24**
2017	4,452	850	648	152	10	218	223	295	1	2,285	**9,133**	**25**
2018	4,577	871	659	155	10	222	230	293	1	2,343	**9,361**	**26**
2019	4,699	890	670	158	10	227	236	290	1	2,399	**9,581**	**26**
2020	4,817	910	680	161	10	230	242	288	1	2,452	**9,791**	**27**
2021	4,935	929	690	164	11	234	249	286	1	2,505	**10,004**	**27**
2022	5,049	948	700	166	11	238	255	284	1	2,556	**10,207**	**28**
2023	5,159	966	708	169	11	241	261	282	1	2,606	**10,403**	**29**
2024	5,267	983	717	171	11	245	267	280	1	2,655	**10,596**	**29**
2025	5,373	1,000	726	173	12	248	273	278	1	2,702	**10,787**	**30**
2026	5,477	1,017	735	176	12	252	279	276	1	2,749	**10,974**	**30**
2027	5,582	1,034	744	178	12	255	285	274	1	2,796	**11,162**	**31**
2028	5,685	1,050	754	181	13	259	291	273	1	2,843	**11,349**	**31**
2029	5,788	1,067	764	184	13	263	298	271	1	2,890	**11,537**	**32**
2030	5,893	1,084	775	187	13	267	304	269	1	2,939	**11,731**	**32**
2031	5,989	1,099	785	189	13	271	310	267	1	2,982	**11,906**	**33**
2032	6,084	1,114	795	192	14	275	316	266	1	3,025	**12,080**	**33**
2033	6,181	1,130	805	195	14	279	322	264	1	3,068	**12,258**	**34**
2034	6,271	1,144	815	197	14	283	327	262	1	3,109	**12,423**	**34**
2035	6,355	1,157	824	200	14	286	332	260	1	3,146	**12,576**	**34**
2036	6,440	1,171	834	202	15	290	337	259	1	3,184	**12,733**	**35**
2037	6,519	1,183	843	205	15	293	342	257	1	3,220	**12,879**	**35**
2038	6,596	1,196	852	207	15	297	347	255	1	3,255	**13,020**	**36**
2039	6,672	1,208	861	210	15	300	352	253	1	3,289	**13,160**	**36**
2040	6,749	1,220	870	212	15	304	356	251	1	3,324	**13,303**	**36**
2041	6,822	1,232	879	215	16	307	361	249	1	3,358	**13,439**	**37**
2042	6,890	1,242	888	217	16	311	365	247	1	3,389	**13,566**	**37**
2043	6,954	1,252	896	219	16	314	369	246	1	3,419	**13,686**	**37**
2044	7,014	1,262	904	222	16	317	372	244	1	3,447	**13,798**	**38**
2045	7,072	1,271	912	224	16	320	376	242	1	3,474	**13,906**	**38**
2046	7,125	1,279	919	226	16	323	379	240	1	3,498	**14,005**	**38**
2047	7,177	1,287	926	228	16	326	383	238	1	3,522	**14,103**	**39**
2048	7,227	1,295	933	230	17	329	386	236	1	3,546	**14,197**	**39**
2049	7,275	1,302	939	231	17	331	389	234	1	3,569	**14,289**	**39**
2050	7,321	1,309	946	233	17	334	392	232	1	3,590	**14,376**	**39**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)									
	Single Family	Multifamily	Commercial	Municipal	Irrigation	New Commercial	Self Supplied	NRW	Total (MG)	AADD (MGD)
2015	2,591	234	386	218	33	1	85	1,114	**4,662**	**13**
2016	2,641	238	386	223	35	1	84	1,139	**4,748**	**13**
2017	2,698	243	387	229	36	1	83	1,163	**4,839**	**13**
2018	2,759	248	387	235	37	1	83	1,187	**4,935**	**14**
2019	2,823	253	388	241	38	1	82	1,211	**5,037**	**14**
2020	2,889	259	389	247	39	1	81	1,237	**5,141**	**14**
2021	2,958	264	390	254	40	1	81	1,263	**5,250**	**14**
2022	3,026	270	391	261	40	1	80	1,289	**5,358**	**15**
2023	3,093	275	392	268	41	1	80	1,315	**5,465**	**15**
2024	3,161	281	393	275	42	1	79	1,341	**5,573**	**15**
2025	3,228	286	395	283	43	1	79	1,367	**5,680**	**16**
2026	3,296	292	396	290	43	1	78	1,393	**5,788**	**16**
2027	3,365	297	397	297	44	1	78	1,420	**5,899**	**16**
2028	3,435	303	399	305	45	1	77	1,447	**6,011**	**16**
2029	3,506	309	400	313	46	1	77	1,475	**6,125**	**17**
2030	3,581	315	402	322	46	1	76	1,504	**6,246**	**17**
2031	3,651	321	403	330	47	1	76	1,531	**6,358**	**17**
2032	3,724	326	404	338	48	1	75	1,558	**6,474**	**18**
2033	3,799	333	406	346	49	1	75	1,586	**6,594**	**18**
2034	3,872	339	407	355	50	1	74	1,613	**6,710**	**18**
2035	3,943	344	408	363	51	1	74	1,640	**6,824**	**19**
2036	4,018	350	410	371	52	1	73	1,668	**6,942**	**19**
2037	4,091	356	411	379	52	1	73	1,695	**7,057**	**19**
2038	4,163	362	412	387	53	1	72	1,722	**7,172**	**20**
2039	4,237	368	413	395	54	1	72	1,750	**7,289**	**20**
2040	4,312	374	414	403	55	1	71	1,778	**7,408**	**20**
2041	4,385	380	415	411	56	1	70	1,806	**7,524**	**21**
2042	4,456	386	417	418	56	1	70	1,832	**7,636**	**21**
2043	4,524	392	418	426	57	1	69	1,858	**7,745**	**21**
2044	4,591	397	418	433	58	1	69	1,883	**7,850**	**22**
2045	4,655	402	419	440	59	1	68	1,907	**7,952**	**22**
2046	4,716	407	420	447	59	1	68	1,930	**8,049**	**22**
2047	4,776	412	421	454	60	1	67	1,953	**8,144**	**22**
2048	4,834	417	422	460	61	1	67	1,975	**8,236**	**23**
2049	4,889	422	423	467	61	1	66	1,996	**8,325**	**23**
2050	4,942	426	424	473	62	1	66	2,016	**8,408**	**23**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family Reside	i Family Reside	Commercial	Institutional	Industrial	Irrigation	Other	Self Supplied	New Commercia	NRW	Total (MG)	AADD (MGD)
2015	1,901	214	497	58	86	53	354	235	1	1,401	**4,800**	**13**
2016	1,931	217	513	59	89	55	359	233	1	1,424	**4,880**	**13**
2017	1,964	220	526	60	91	57	366	230	1	1,450	**4,963**	**14**
2018	1,998	223	535	61	93	58	373	228	1	1,476	**5,045**	**14**
2019	2,033	226	544	62	95	59	380	225	1	1,500	**5,126**	**14**
2020	2,069	229	552	63	97	60	387	223	1	1,524	**5,205**	**14**
2021	2,107	233	560	64	99	61	394	221	1	1,549	**5,288**	**14**
2022	2,143	236	567	66	100	62	402	219	1	1,573	**5,368**	**15**
2023	2,179	239	574	67	101	63	409	217	1	1,596	**5,446**	**15**
2024	2,215	242	581	68	103	64	417	215	1	1,620	**5,525**	**15**
2025	2,251	246	588	69	104	65	425	213	1	1,643	**5,604**	**15**
2026	2,287	249	595	71	106	65	433	211	1	1,666	**5,683**	**16**
2027	2,324	252	603	72	107	66	441	208	1	1,691	**5,766**	**16**
2028	2,362	256	611	73	109	67	449	206	1	1,715	**5,850**	**16**
2029	2,400	259	619	75	111	68	458	204	1	1,741	**5,936**	**16**
2030	2,440	263	628	76	113	70	467	202	1	1,768	**6,028**	**17**
2031	2,478	266	636	78	114	71	476	200	1	1,792	**6,112**	**17**
2032	2,517	269	644	79	116	72	485	198	1	1,817	**6,199**	**17**
2033	2,557	273	653	81	118	73	494	197	1	1,843	**6,288**	**17**
2034	2,596	277	661	82	119	74	503	195	1	1,868	**6,374**	**17**
2035	2,633	280	669	83	121	75	511	193	1	1,892	**6,457**	**18**
2036	2,672	283	677	85	123	76	520	191	1	1,917	**6,544**	**18**
2037	2,710	287	685	86	124	77	528	189	1	1,941	**6,628**	**18**
2038	2,748	290	693	87	126	78	536	187	1	1,965	**6,711**	**18**
2039	2,787	294	701	89	127	79	544	185	1	1,990	**6,797**	**19**
2040	2,827	297	709	90	129	80	553	184	1	2,015	**6,886**	**19**
2041	2,866	301	717	92	131	81	562	182	1	2,041	**6,973**	**19**
2042	2,905	304	725	93	132	82	570	180	1	2,065	**7,058**	**19**
2043	2,942	308	733	94	134	83	578	179	1	2,090	**7,141**	**20**
2044	2,979	311	741	96	136	84	586	177	1	2,113	**7,223**	**20**
2045	3,015	314	748	97	137	85	594	175	1	2,137	**7,304**	**20**
2046	3,051	318	756	98	139	86	601	174	1	2,160	**7,382**	**20**
2047	3,086	321	763	99	140	87	609	172	1	2,183	**7,461**	**20**
2048	3,122	324	770	101	142	88	617	170	1	2,206	**7,539**	**21**
2049	3,158	327	777	102	143	89	625	169	1	2,229	**7,618**	**21**
2050	3,193	330	784	103	145	89	633	167	1	2,251	**7,696**	**21**

Attachment 11

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multi Family	Commercial	Industrial	Irrigation	Agricultural	Self Supplied	New Commercial	Anheuser-Busch	NRW	Total	AADD (MGD)
2015	2,054	228	402	2,156	23	17	212	4	1,872	3,067	**10,035**	**27**
2016	2,074	230	408	2,194	24	17	211	103	1,873	3,101	**10,236**	**28**
2017	2,095	232	412	2,221	24	17	210	174	1,875	3,163	**10,424**	**29**
2018	2,116	233	415	2,238	24	17	210	214	1,878	3,222	**10,568**	**29**
2019	2,136	235	417	2,255	24	17	209	250	1,881	3,266	**10,692**	**29**
2020	2,157	237	419	2,272	25	17	208	286	1,885	3,305	**10,811**	**30**
2021	2,180	239	423	2,293	25	17	208	327	1,891	3,346	**10,947**	**30**
2022	2,202	241	425	2,312	25	18	207	364	1,896	3,387	**11,078**	**30**
2023	2,224	243	429	2,334	25	18	207	408	1,902	3,427	**11,217**	**31**
2024	2,244	245	432	2,354	25	18	207	446	1,908	3,468	**11,346**	**31**
2025	2,264	246	435	2,375	26	18	206	484	1,914	3,508	**11,475**	**31**
2026	2,282	248	438	2,394	26	18	206	519	1,920	3,545	**11,596**	**32**
2027	2,301	250	441	2,416	26	18	205	559	1,927	3,583	**11,725**	**32**
2028	2,319	251	445	2,438	26	18	205	601	1,933	3,623	**11,859**	**32**
2029	2,337	253	448	2,460	27	18	205	641	1,940	3,664	**11,991**	**33**
2030	2,356	254	452	2,483	27	18	205	681	1,948	3,707	**12,130**	**33**
2031	2,370	255	456	2,509	27	18	204	734	1,954	3,743	**12,272**	**34**
2032	2,387	257	460	2,537	27	18	204	790	1,961	3,788	**12,431**	**34**
2033	2,405	258	465	2,566	28	18	204	844	1,970	3,839	**12,596**	**35**
2034	2,421	260	469	2,592	28	18	203	897	1,976	3,887	**12,752**	**35**
2035	2,437	261	473	2,616	28	18	203	947	1,982	3,932	**12,898**	**35**
2036	2,452	262	477	2,640	29	18	203	996	1,988	3,975	**13,040**	**36**
2037	2,467	264	480	2,662	29	18	202	1,041	1,993	4,017	**13,173**	**36**
2038	2,481	265	483	2,684	29	18	202	1,088	1,998	4,057	**13,306**	**36**
2039	2,497	266	487	2,706	29	19	201	1,131	2,003	4,099	**13,438**	**37**
2040	2,513	268	491	2,731	30	19	201	1,183	2,010	4,141	**13,585**	**37**
2041	2,528	269	494	2,754	30	19	200	1,227	2,015	4,182	**13,719**	**38**
2042	2,542	270	497	2,775	30	19	200	1,271	2,020	4,222	**13,847**	**38**
2043	2,556	271	501	2,796	30	19	199	1,316	2,025	4,261	**13,974**	**38**
2044	2,569	272	504	2,818	31	19	199	1,361	2,030	4,299	**14,101**	**39**
2045	2,583	273	507	2,838	31	19	198	1,405	2,034	4,338	**14,226**	**39**
2046	2,595	274	510	2,857	31	19	198	1,444	2,038	4,374	**14,339**	**39**
2047	2,607	275	512	2,875	31	19	197	1,482	2,043	4,409	**14,452**	**40**
2048	2,620	277	515	2,892	31	19	196	1,516	2,047	4,444	**14,558**	**40**
2049	2,633	278	517	2,909	32	19	196	1,550	2,052	4,477	**14,663**	**40**
2050	2,645	279	520	2,926	32	19	195	1,584	2,056	4,508	**14,764**	**40**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)												
	Single Family	Multifamily	Commercial	Institutional	Industrial	Irrigation	Agricultural	Other	Self Supplied	New Commercial	NRW	Total	AADD (MGD)
2015	4,050	577	251	51	229	257	102	155	374	1	1,214	**7,261**	**20**
2016	4,144	588	258	52	236	265	102	159	372	1	1,243	**7,420**	**20**
2017	4,238	599	263	53	242	272	102	163	369	1	1,270	**7,573**	**21**
2018	4,333	610	267	55	247	277	102	167	367	1	1,296	**7,722**	**21**
2019	4,438	622	271	56	252	283	102	171	365	1	1,324	**7,884**	**22**
2020	4,543	635	274	58	256	287	102	176	362	1	1,351	**8,045**	**22**
2021	4,653	648	278	59	260	292	103	180	361	1	1,380	**8,214**	**23**
2022	4,761	660	281	61	264	297	103	185	359	1	1,408	**8,379**	**23**
2023	4,868	673	284	62	268	301	103	189	357	1	1,435	**8,542**	**23**
2024	4,986	686	288	64	273	306	104	194	355	1	1,466	**8,722**	**24**
2025	5,103	700	292	65	278	312	104	200	353	1	1,496	**8,902**	**24**
2026	5,223	713	296	67	283	317	104	205	350	1	1,527	**9,086**	**25**
2027	5,343	727	300	69	288	323	105	210	348	1	1,558	**9,272**	**25**
2028	5,462	741	305	71	293	329	105	216	346	1	1,590	**9,457**	**26**
2029	5,582	754	309	72	298	335	105	221	344	1	1,621	**9,642**	**26**
2030	5,704	768	314	74	304	341	106	227	342	1	1,653	**9,832**	**27**
2031	5,828	782	319	76	310	347	106	232	340	1	1,685	**10,027**	**27**
2032	5,958	796	324	78	316	354	107	238	338	1	1,719	**10,229**	**28**
2033	6,092	812	330	80	322	362	107	244	336	1	1,753	**10,439**	**29**
2034	6,223	827	335	82	329	369	107	250	334	1	1,787	**10,644**	**29**
2035	6,352	841	341	84	335	376	108	256	332	1	1,820	**10,846**	**30**
2036	6,493	858	347	86	342	384	108	262	331	1	1,857	**11,068**	**30**
2037	6,632	874	353	88	349	392	108	269	329	1	1,893	**11,287**	**31**
2038	6,771	890	359	90	356	400	109	275	327	1	1,930	**11,506**	**32**
2039	6,914	906	365	92	363	408	109	281	325	1	1,967	**11,731**	**32**
2040	7,060	923	371	94	371	416	109	287	324	1	2,005	**11,962**	**33**
2041	7,215	941	375	96	376	422	110	294	322	1	2,046	**12,199**	**33**
2042	7,369	959	380	99	382	428	110	301	320	1	2,086	**12,434**	**34**
2043	7,521	977	385	101	388	435	110	308	319	1	2,125	**12,669**	**35**
2044	7,673	994	391	103	394	443	110	314	317	1	2,164	**12,904**	**35**
2045	7,825	1,012	396	105	401	450	111	321	315	1	2,203	**13,139**	**36**
2046	7,989	1,031	402	108	408	458	111	328	314	1	2,246	**13,394**	**37**
2047	8,154	1,050	408	110	415	465	111	335	312	1	2,288	**13,650**	**37**
2048	8,320	1,069	413	112	421	473	111	343	310	1	2,331	**13,905**	**38**
2049	8,486	1,089	418	115	428	480	111	350	309	1	2,374	**14,160**	**39**
2050	8,650	1,107	423	117	433	486	112	357	307	1	2,416	**14,411**	**39**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Agricultural	Other	New Commercial	NRW	Total	AADD (MGD)
2015	4,048	1,867	1,024	424	858	3	20	1	891	**9,136**	**25**
2016	4,077	1,880	1,022	436	867	3	20	170	900	**9,375**	**26**
2017	4,107	1,893	1,020	446	876	3	20	302	925	**9,591**	**26**
2018	4,137	1,906	1,018	453	886	3	21	393	946	**9,764**	**27**
2019	4,163	1,917	1,017	459	895	3	21	466	962	**9,903**	**27**
2020	4,190	1,928	1,016	464	904	3	21	527	976	**10,030**	**27**
2021	4,221	1,942	1,017	469	915	3	21	588	990	**10,166**	**28**
2022	4,250	1,954	1,017	475	925	3	21	644	1,003	**10,292**	**28**
2023	4,278	1,966	1,017	480	935	3	22	695	1,015	**10,411**	**29**
2024	4,301	1,976	1,018	484	945	3	22	739	1,026	**10,514**	**29**
2025	4,324	1,986	1,018	489	954	3	22	789	1,036	**10,622**	**29**
2026	4,343	1,994	1,019	494	964	3	22	834	1,046	**10,719**	**29**
2027	4,363	2,003	1,020	498	973	3	23	882	1,056	**10,821**	**30**
2028	4,383	2,011	1,021	504	982	3	23	933	1,066	**10,925**	**30**
2029	4,402	2,019	1,022	508	992	3	23	981	1,076	**11,027**	**30**
2030	4,423	2,028	1,024	514	1,002	3	23	1,028	1,087	**11,132**	**30**
2031	4,435	2,033	1,025	518	1,010	3	23	1,065	1,095	**11,207**	**31**
2032	4,450	2,039	1,026	522	1,019	3	24	1,106	1,103	**11,292**	**31**
2033	4,469	2,047	1,028	527	1,028	3	24	1,148	1,111	**11,386**	**31**
2034	4,485	2,054	1,030	531	1,036	3	24	1,188	1,120	**11,471**	**31**
2035	4,500	2,060	1,030	535	1,044	3	24	1,226	1,127	**11,550**	**32**
2036	4,513	2,065	1,031	539	1,051	3	24	1,256	1,134	**11,616**	**32**
2037	4,524	2,070	1,032	542	1,057	3	24	1,283	1,140	**11,674**	**32**
2038	4,535	2,074	1,032	545	1,063	3	25	1,308	1,146	**11,731**	**32**
2039	4,548	2,080	1,032	548	1,070	3	25	1,334	1,151	**11,791**	**32**
2040	4,564	2,086	1,033	551	1,077	3	25	1,364	1,158	**11,862**	**32**
2041	4,575	2,091	1,034	554	1,082	3	25	1,385	1,163	**11,913**	**33**
2042	4,584	2,095	1,035	557	1,087	3	25	1,403	1,168	**11,957**	**33**
2043	4,594	2,098	1,035	559	1,093	3	25	1,424	1,172	**12,003**	**33**
2044	4,602	2,102	1,035	562	1,097	3	25	1,446	1,176	**12,049**	**33**
2045	4,611	2,105	1,035	564	1,102	3	26	1,469	1,181	**12,097**	**33**
2046	4,616	2,107	1,035	566	1,106	3	26	1,484	1,184	**12,128**	**33**
2047	4,622	2,109	1,035	569	1,110	3	26	1,501	1,187	**12,163**	**33**
2048	4,628	2,111	1,035	571	1,115	4	26	1,518	1,191	**12,197**	**33**
2049	4,634	2,113	1,035	573	1,119	4	26	1,534	1,194	**12,232**	**34**
2050	4,639	2,115	1,035	575	1,123	4	26	1,551	1,198	**12,266**	**34**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercial	NRW	Total	AADD (MGD)
2015	12,814	3,713	5,355	699	401	0	799	1	1	2,246	**26,029**	**71**
2016	12,940	3,747	5,548	709	418	0	832	1	1	2,275	**26,470**	**73**
2017	13,067	3,782	5,705	718	432	0	859	1	1	2,314	**26,880**	**74**
2018	13,196	3,817	5,829	728	443	0	881	1	1	2,351	**27,247**	**75**
2019	13,320	3,851	5,936	738	452	0	900	1	1	2,382	**27,579**	**76**
2020	13,445	3,885	6,030	748	461	0	917	1	1	2,411	**27,898**	**76**
2021	13,583	3,922	6,126	758	469	0	934	1	1	2,441	**28,236**	**77**
2022	13,716	3,958	6,210	769	477	0	949	1	1	2,470	**28,552**	**78**
2023	13,847	3,993	6,293	780	485	0	964	1	1	2,498	**28,861**	**79**
2024	13,969	4,025	6,371	790	492	0	978	1	1	2,523	**29,150**	**80**
2025	14,088	4,057	6,447	801	499	0	992	1	1	2,548	**29,432**	**81**
2026	14,200	4,086	6,514	811	505	0	1,004	1	1	2,571	**29,693**	**81**
2027	14,314	4,116	6,582	821	511	0	1,017	1	1	2,595	**29,957**	**82**
2028	14,426	4,145	6,651	832	517	0	1,029	1	1	2,618	**30,219**	**83**
2029	14,537	4,173	6,716	842	523	0	1,041	1	1	2,640	**30,474**	**83**
2030	14,656	4,204	6,780	854	529	0	1,052	1	1	2,664	**30,740**	**84**
2031	14,749	4,227	6,837	863	534	0	1,063	1	1	2,683	**30,958**	**85**
2032	14,854	4,254	6,896	874	539	0	1,073	1	1	2,703	**31,194**	**85**
2033	14,970	4,284	6,960	884	545	0	1,085	1	1	2,724	**31,455**	**86**
2034	15,078	4,312	7,020	895	551	0	1,096	1	1	2,745	**31,697**	**87**
2035	15,179	4,338	7,076	904	556	0	1,106	1	1	2,764	**31,925**	**87**
2036	15,280	4,364	7,130	913	561	0	1,116	1	1	2,782	**32,149**	**88**
2037	15,374	4,389	7,181	922	566	0	1,126	1	1	2,800	**32,359**	**89**
2038	15,469	4,414	7,230	931	570	0	1,135	1	1	2,818	**32,569**	**89**
2039	15,570	4,441	7,281	940	575	0	1,145	1	1	2,837	**32,791**	**90**
2040	15,679	4,470	7,340	949	581	0	1,155	1	1	2,857	**33,032**	**90**
2041	15,775	4,495	7,389	958	585	0	1,165	1	1	2,875	**33,244**	**91**
2042	15,867	4,519	7,440	966	590	0	1,174	1	1	2,893	**33,451**	**92**
2043	15,957	4,543	7,490	974	595	0	1,184	1	1	2,910	**33,655**	**92**
2044	16,045	4,567	7,542	982	600	0	1,193	1	1	2,927	**33,857**	**93**
2045	16,133	4,590	7,595	990	605	0	1,203	1	1	2,945	**34,062**	**93**
2046	16,210	4,610	7,645	997	610	0	1,213	1	1	2,960	**34,247**	**94**
2047	16,290	4,631	7,697	1,004	615	0	1,223	1	1	2,977	**34,439**	**94**
2048	16,371	4,653	7,751	1,012	620	0	1,233	1	1	2,993	**34,635**	**95**
2049	16,452	4,674	7,807	1,020	625	0	1,243	1	1	3,010	**34,833**	**95**
2050	16,530	4,695	7,862	1,027	630	0	1,254	1	1	3,027	**35,027**	**96**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercial	Self-Supplied	NRW	Total	AAD (MGD)
2015	2,290	328	508	68	313	379	186	0	415	496	**4,984**	**14**
2016	2,341	333	517	70	319	387	190	0	411	506	**5,073**	**14**
2017	2,393	339	523	71	323	395	192	0	406	515	**5,157**	**14**
2018	2,444	344	527	72	326	403	194	0	402	523	**5,236**	**14**
2019	2,498	350	532	74	330	411	196	0	397	532	**5,320**	**15**
2020	2,553	355	536	76	333	420	198	0	393	540	**5,404**	**15**
2021	2,610	362	541	77	336	429	200	0	389	549	**5,494**	**15**
2022	2,666	367	545	79	340	439	202	0	385	558	**5,582**	**15**
2023	2,721	373	550	81	343	448	204	0	382	567	**5,668**	**16**
2024	2,778	379	555	82	347	458	206	0	378	576	**5,759**	**16**
2025	2,836	386	560	84	350	468	209	0	374	585	**5,851**	**16**
2026	2,892	392	566	86	354	478	211	0	370	594	**5,943**	**16**
2027	2,950	398	572	88	359	488	214	0	366	604	**6,037**	**17**
2028	3,006	404	578	90	363	498	216	0	362	613	**6,131**	**17**
2029	3,062	410	585	91	368	509	219	0	358	622	**6,225**	**17**
2030	3,120	416	592	93	373	519	222	0	355	632	**6,323**	**17**
2031	3,176	422	600	95	378	530	225	0	351	642	**6,418**	**18**
2032	3,235	428	608	97	384	541	229	0	347	651	**6,519**	**18**
2033	3,296	435	616	99	390	552	232	0	344	662	**6,625**	**18**
2034	3,355	441	625	101	396	563	236	0	340	672	**6,728**	**18**
2035	3,413	447	633	103	402	573	239	0	337	682	**6,828**	**19**
2036	3,475	454	642	105	408	584	243	0	333	692	**6,937**	**19**
2037	3,536	460	651	107	414	595	247	0	330	702	**7,042**	**19**
2038	3,597	467	660	109	420	606	250	0	326	713	**7,149**	**20**
2039	3,659	474	669	111	427	617	254	0	323	724	**7,258**	**20**
2040	3,723	481	680	113	434	628	258	0	320	735	**7,372**	**20**
2041	3,789	488	690	115	441	640	263	0	317	747	**7,490**	**21**
2042	3,854	495	701	117	449	651	267	0	314	758	**7,606**	**21**
2043	3,919	502	712	119	456	662	272	0	311	769	**7,722**	**21**
2044	3,983	509	723	121	464	673	276	0	308	781	**7,838**	**21**
2045	4,047	516	734	123	472	685	281	0	305	792	**7,954**	**22**
2046	4,114	523	745	125	480	696	286	0	301	805	**8,075**	**22**
2047	4,181	530	757	127	488	708	291	0	298	817	**8,198**	**22**
2048	4,248	538	769	129	497	720	296	0	295	829	**8,322**	**23**
2049	4,315	545	782	132	505	732	301	0	293	841	**8,446**	**23**
2050	4,382	552	794	134	514	744	306	0	290	854	**8,568**	**23**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	Apt/Condo (MFR)	Commercial	Institutional (SCH)	Municipal (GOV)	Other	Irrigation	New Commercial	NRW	Total	AAD (MGD)
2015	11,029	3,945	5,013	233	140	27	662	1	5,579	**26,628**	**73**
2016	11,094	3,963	5,154	235	141	27	684	1	5,632	**26,931**	**74**
2017	11,160	3,982	5,267	238	143	28	701	1	5,697	**27,216**	**75**
2018	11,228	4,001	5,351	240	144	28	715	1	5,759	**27,467**	**75**
2019	11,283	4,016	5,420	242	146	28	726	1	5,806	**27,667**	**76**
2020	11,341	4,031	5,482	244	147	28	736	1	5,849	**27,859**	**76**
2021	11,409	4,050	5,547	247	148	29	747	1	5,896	**28,073**	**77**
2022	11,473	4,066	5,606	249	150	29	756	1	5,940	**28,271**	**77**
2023	11,535	4,082	5,661	252	151	29	765	1	5,982	**28,458**	**78**
2024	11,582	4,093	5,705	254	153	30	773	1	6,014	**28,604**	**78**
2025	11,628	4,103	5,747	256	154	30	780	1	6,045	**28,744**	**79**
2026	11,665	4,109	5,782	258	155	30	786	1	6,071	**28,858**	**79**
2027	11,704	4,116	5,817	261	157	30	792	1	6,097	**28,975**	**79**
2028	11,742	4,123	5,852	263	158	31	798	1	6,121	**29,089**	**80**
2029	11,779	4,128	5,884	265	159	31	804	1	6,145	**29,196**	**80**
2030	11,822	4,136	5,915	267	161	31	809	1	6,172	**29,314**	**80**
2031	11,840	4,135	5,938	269	162	31	813	1	6,184	**29,373**	**80**
2032	11,867	4,138	5,963	271	163	32	818	1	6,199	**29,451**	**81**
2033	11,904	4,144	5,994	273	164	32	823	1	6,218	**29,552**	**81**
2034	11,934	4,148	6,021	275	165	32	828	1	6,234	**29,638**	**81**
2035	11,959	4,151	6,045	277	166	32	833	1	6,248	**29,712**	**81**
2036	11,981	4,153	6,066	278	167	32	836	1	6,260	**29,775**	**82**
2037	11,998	4,154	6,082	280	168	33	840	1	6,269	**29,825**	**82**
2038	12,016	4,155	6,098	281	169	33	843	1	6,279	**29,875**	**82**
2039	12,040	4,158	6,113	283	170	33	846	1	6,291	**29,935**	**82**
2040	12,068	4,164	6,136	284	171	33	850	1	6,306	**30,014**	**82**
2041	12,086	4,166	6,152	285	172	33	854	1	6,316	**30,064**	**82**
2042	12,102	4,167	6,166	287	172	33	857	1	6,325	**30,109**	**82**
2043	12,116	4,167	6,181	288	173	33	860	1	6,333	**30,152**	**83**
2044	12,128	4,167	6,196	289	174	34	863	1	6,341	**30,193**	**83**
2045	12,141	4,168	6,212	290	174	34	866	1	6,349	**30,235**	**83**
2046	12,145	4,165	6,225	291	175	34	869	1	6,353	**30,257**	**83**
2047	12,150	4,163	6,240	292	175	34	872	1	6,358	**30,285**	**83**
2048	12,157	4,161	6,256	293	176	34	875	1	6,365	**30,317**	**83**
2049	12,163	4,159	6,272	293	176	34	879	1	6,371	**30,350**	**83**
2050	12,168	4,157	6,289	294	177	34	882	1	6,377	**30,379**	**83**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	New Commercial	NRW	Total	AADD (MGD)
2015	2,342	560	384	80	116	190	88	0	922	**4,683**	**13**
2016	2,380	569	397	81	121	194	92	0	940	**4,775**	**13**
2017	2,418	577	408	83	125	198	95	0	959	**4,863**	**13**
2018	2,457	586	416	85	129	202	97	0	977	**4,948**	**14**
2019	2,498	595	424	86	132	206	100	0	994	**5,035**	**14**
2020	2,538	604	431	88	135	211	102	0	1,012	**5,120**	**14**
2021	2,582	613	438	90	137	215	104	0	1,030	**5,210**	**14**
2022	2,624	622	445	92	140	220	106	0	1,047	**5,296**	**15**
2023	2,666	632	451	94	143	224	108	0	1,064	**5,382**	**15**
2024	2,709	641	458	96	145	229	110	0	1,082	**5,469**	**15**
2025	2,752	650	464	98	147	234	111	0	1,099	**5,557**	**15**
2026	2,794	659	470	100	150	239	113	0	1,116	**5,643**	**15**
2027	2,837	669	477	102	152	244	115	0	1,134	**5,730**	**16**
2028	2,880	678	483	104	155	249	117	0	1,151	**5,816**	**16**
2029	2,922	687	490	106	157	254	119	0	1,168	**5,903**	**16**
2030	2,965	696	496	108	160	259	121	0	1,186	**5,992**	**16**
2031	3,007	705	503	111	163	264	123	0	1,203	**6,077**	**17**
2032	3,050	714	510	113	165	269	125	0	1,220	**6,166**	**17**
2033	3,096	724	517	115	168	275	127	0	1,238	**6,260**	**17**
2034	3,141	733	524	117	171	280	129	0	1,256	**6,351**	**17**
2035	3,184	743	532	119	174	285	131	0	1,273	**6,440**	**18**
2036	3,230	753	539	121	177	290	133	0	1,291	**6,535**	**18**
2037	3,275	762	546	124	179	295	136	0	1,309	**6,627**	**18**
2038	3,321	772	554	126	182	300	138	0	1,327	**6,720**	**18**
2039	3,367	782	561	128	185	305	140	0	1,346	**6,815**	**19**
2040	3,416	793	569	130	188	311	142	0	1,365	**6,914**	**19**
2041	3,465	804	577	132	191	316	144	0	1,385	**7,014**	**19**
2042	3,513	814	585	135	194	322	147	0	1,404	**7,113**	**19**
2043	3,561	825	592	137	197	327	149	0	1,423	**7,212**	**20**
2044	3,608	835	600	139	200	332	151	0	1,443	**7,310**	**20**
2045	3,656	845	609	141	204	338	154	0	1,462	**7,408**	**20**
2046	3,704	856	617	144	207	343	156	0	1,482	**7,509**	**21**
2047	3,754	867	625	146	210	349	159	0	1,502	**7,612**	**21**
2048	3,803	878	634	148	214	354	161	0	1,522	**7,714**	**21**
2049	3,853	888	643	151	217	360	164	0	1,542	**7,817**	**21**
2050	3,901	899	651	153	220	365	167	0	1,562	**7,919**	**22**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AAD (MGD)
2015	2,477	160	455	57	30	84	200	490	341	**4,295**	**12**
2016	2,501	161	469	60	30	87	201	485	344	**4,339**	**12**
2017	2,525	162	481	61	31	89	203	480	347	**4,380**	**12**
2018	2,550	163	489	63	31	91	205	475	351	**4,417**	**12**
2019	2,576	164	496	64	31	93	207	470	354	**4,455**	**12**
2020	2,603	165	502	65	31	94	209	465	357	**4,492**	**12**
2021	2,633	166	507	66	32	96	211	461	361	**4,532**	**12**
2022	2,661	167	512	66	32	97	213	457	364	**4,569**	**13**
2023	2,689	168	516	67	32	98	216	452	367	**4,605**	**13**
2024	2,716	169	518	67	33	98	218	448	369	**4,638**	**13**
2025	2,743	170	521	68	33	99	220	443	372	**4,670**	**13**
2026	2,767	171	523	68	33	100	222	439	374	**4,698**	**13**
2027	2,791	172	524	69	34	100	225	435	377	**4,726**	**13**
2028	2,815	173	526	69	34	101	227	430	379	**4,754**	**13**
2029	2,839	174	528	69	34	101	229	426	381	**4,782**	**13**
2030	2,865	175	529	70	35	102	231	422	384	**4,812**	**13**
2031	2,882	175	529	70	35	102	233	418	385	**4,829**	**13**
2032	2,901	176	530	70	35	102	235	414	387	**4,850**	**13**
2033	2,922	177	531	70	36	102	237	410	388	**4,874**	**13**
2034	2,942	177	532	70	36	103	239	406	390	**4,896**	**13**
2035	2,960	178	533	71	36	103	241	402	392	**4,916**	**13**
2036	2,975	178	534	71	36	103	242	398	393	**4,932**	**14**
2037	2,989	179	535	71	37	104	243	394	394	**4,945**	**14**
2038	3,002	179	536	71	37	104	245	391	395	**4,959**	**14**
2039	3,017	179	537	72	37	105	246	387	396	**4,976**	**14**
2040	3,033	180	539	72	37	105	247	383	397	**4,995**	**14**
2041	3,045	180	541	72	37	106	248	380	398	**5,009**	**14**
2042	3,057	181	543	73	37	106	249	376	399	**5,022**	**14**
2043	3,068	181	545	73	38	107	250	373	400	**5,035**	**14**
2044	3,079	181	547	74	38	107	251	369	401	**5,048**	**14**
2045	3,089	181	550	74	38	108	252	366	402	**5,060**	**14**
2046	3,099	182	552	75	38	109	253	362	403	**5,072**	**14**
2047	3,109	182	555	75	38	109	254	359	404	**5,085**	**14**
2048	3,119	182	558	76	38	110	255	355	405	**5,099**	**14**
2049	3,129	182	561	76	38	111	256	352	406	**5,112**	**14**
2050	3,139	182	564	77	39	112	257	348	407	**5,125**	**14**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Residential	Commercial	Industrial	Municipal	Irrigation	Other	New Commercial	Self Supplied	NRW	Total	AAD (MGD)
2015	4,423	933	467	63	259	37	1	198	1,886	**8,267**	**23**
2016	4,558	956	480	65	269	39	1	197	1,949	**8,513**	**23**
2017	4,694	973	490	67	278	40	1	195	2,005	**8,742**	**24**
2018	4,831	983	496	69	285	41	1	193	2,058	**8,957**	**25**
2019	4,992	997	504	72	291	43	1	192	2,118	**9,209**	**25**
2020	5,154	1,010	511	74	297	44	1	190	2,176	**9,457**	**26**
2021	5,321	1,023	519	77	304	46	1	189	2,235	**9,713**	**27**
2022	5,487	1,036	526	79	310	47	1	187	2,292	**9,966**	**27**
2023	5,651	1,049	534	82	316	49	1	186	2,350	**10,217**	**28**
2024	5,834	1,065	543	85	322	51	1	185	2,416	**10,501**	**29**
2025	6,017	1,081	552	88	328	52	1	183	2,480	**10,783**	**30**
2026	6,210	1,100	562	91	334	54	1	182	2,549	**11,084**	**30**
2027	6,403	1,119	573	95	341	56	1	181	2,618	**11,387**	**31**
2028	6,597	1,139	584	98	348	58	1	180	2,687	**11,691**	**32**
2029	6,789	1,160	596	101	354	60	1	179	2,757	**11,997**	**33**
2030	6,986	1,181	607	104	361	62	1	178	2,828	**12,309**	**34**
2031	7,203	1,208	622	108	368	64	1	176	2,909	**12,660**	**35**
2032	7,427	1,237	638	112	375	67	1	175	2,990	**13,021**	**36**
2033	7,656	1,267	655	116	382	69	1	174	3,074	**13,393**	**37**
2034	7,882	1,298	672	120	389	71	1	173	3,156	**13,762**	**38**
2035	8,105	1,329	689	124	395	74	1	172	3,238	**14,127**	**39**
2036	8,361	1,367	710	128	402	76	1	171	3,334	**14,550**	**40**
2037	8,613	1,406	731	132	408	79	1	169	3,429	**14,968**	**41**
2038	8,866	1,445	753	136	415	81	1	168	3,524	**15,389**	**42**
2039	9,124	1,485	775	141	421	84	1	167	3,621	**15,818**	**43**
2040	9,385	1,528	798	145	428	86	1	166	3,721	**16,258**	**45**
2041	9,677	1,578	826	150	435	89	1	164	3,833	**16,754**	**46**
2042	9,966	1,629	854	155	442	92	1	163	3,945	**17,248**	**47**
2043	10,255	1,682	883	159	449	95	1	162	4,058	**17,744**	**49**
2044	10,541	1,736	913	164	456	98	1	161	4,170	**18,241**	**50**
2045	10,828	1,793	945	169	463	101	1	159	4,284	**18,744**	**51**
2046	11,153	1,860	982	175	471	104	1	158	4,414	**19,317**	**53**
2047	11,479	1,931	1,021	180	479	107	1	157	4,546	**19,901**	**55**
2048	11,806	2,008	1,063	186	488	110	1	156	4,680	**20,498**	**56**
2049	12,133	2,093	1,110	191	498	114	1	154	4,816	**21,111**	**58**
2050	12,458	2,188	1,162	197	510	117	1	153	4,956	**21,741**	**60**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	Self-Supplied	NRW	Total	AAD (MGD)
2015	15,030	8,618	13,358	239	637	803	55	177	239	12,919	**52,075**	**143**
2016	15,241	8,731	13,749	244	658	817	57	180	237	13,146	**53,059**	**145**
2017	15,453	8,845	14,070	248	675	831	58	184	235	13,395	**53,994**	**148**
2018	15,669	8,960	14,322	252	689	846	59	187	233	13,632	**54,849**	**150**
2019	15,889	9,078	14,561	257	702	861	60	190	231	13,852	**55,682**	**153**
2020	16,111	9,197	14,786	261	714	876	61	194	229	14,063	**56,494**	155
2021	16,349	9,325	15,030	266	728	893	63	197	228	14,280	**57,358**	**157**
2022	16,580	9,449	15,262	271	740	910	64	201	226	14,493	**58,196**	**159**
2023	16,808	9,571	15,505	276	754	926	65	204	224	14,702	**59,035**	**162**
2024	17,037	9,694	15,752	281	767	943	66	208	223	14,914	**59,885**	**164**
2025	17,262	9,814	15,997	286	780	960	67	212	221	15,126	**60,727**	**166**
2026	17,484	9,933	16,228	291	793	977	68	216	220	15,334	**61,545**	**169**
2027	17,708	10,052	16,464	297	806	995	69	220	218	15,542	**62,370**	**171**
2028	17,930	10,170	16,712	302	819	1,012	71	224	217	15,748	**63,203**	**173**
2029	18,149	10,286	16,947	307	832	1,030	72	227	216	15,955	**64,022**	**175**
2030	18,378	10,408	17,183	313	845	1,049	73	232	214	16,169	**64,862**	**178**
2031	18,590	10,520	17,419	318	858	1,066	74	235	213	16,365	**65,658**	**180**
2032	18,816	10,640	17,662	324	871	1,085	75	239	211	16,569	**66,493**	**182**
2033	19,057	10,769	17,931	329	885	1,104	76	244	210	16,784	**67,389**	**185**
2034	19,289	10,893	18,188	335	899	1,122	77	248	209	16,995	**68,255**	**187**
2035	19,514	11,013	18,439	340	913	1,139	79	252	207	17,198	**69,093**	**189**
2036	19,753	11,141	18,703	345	927	1,158	80	256	206	17,416	**69,984**	**192**
2037	19,985	11,265	18,958	351	941	1,175	81	259	204	17,627	**70,847**	**194**
2038	20,219	11,390	19,213	356	955	1,193	82	263	203	17,840	**71,713**	**196**
2039	20,462	11,520	19,471	361	969	1,211	83	267	201	18,061	**72,606**	**199**
2040	20,714	11,655	19,754	367	984	1,229	85	271	200	18,289	**73,549**	**202**
2041	20,967	11,791	20,031	372	999	1,248	86	276	199	18,521	**74,488**	**204**
2042	21,215	11,924	20,308	378	1,014	1,266	87	280	197	18,749	**75,417**	**207**
2043	21,460	12,055	20,585	383	1,029	1,284	89	284	196	18,977	**76,341**	**209**
2044	21,703	12,185	20,866	388	1,044	1,302	90	287	194	19,204	**77,264**	**212**
2045	21,946	12,315	21,150	394	1,060	1,320	91	291	192	19,432	**78,192**	**214**
2046	22,190	12,445	21,441	399	1,076	1,338	93	295	191	19,664	**79,132**	**217**
2047	22,436	12,577	21,741	404	1,092	1,356	94	299	189	19,900	**80,089**	**219**
2048	22,685	12,710	22,044	410	1,109	1,375	95	304	188	20,140	**81,059**	**222**
2049	22,934	12,842	22,357	415	1,126	1,393	97	308	186	20,381	**82,039**	**225**
2050	23,179	12,973	22,671	421	1,143	1,411	98	312	185	20,621	**83,014**	**227**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Institutional	Industrial	Municipal	Irrigation	Other	New Commercial	NRW	Total	AAD (MGD)
2015	15,476	4,173	3,277	424	196	280	776	1,248	1	4,960	**30,812**	**84**
2016	15,735	4,242	3,398	442	204	286	809	1,274	1	5,062	**31,454**	**86**
2017	15,996	4,312	3,502	458	211	292	837	1,300	1	5,167	**32,076**	**88**
2018	16,260	4,382	3,585	470	217	298	860	1,327	1	5,270	**32,670**	**90**
2019	16,537	4,456	3,666	482	223	304	882	1,355	1	5,371	**33,278**	**91**
2020	16,817	4,531	3,739	493	228	310	902	1,384	1	5,470	**33,875**	**93**
2021	17,112	4,610	3,813	504	233	317	923	1,414	1	5,573	**34,500**	**95**
2022	17,401	4,686	3,880	515	238	324	941	1,445	1	5,673	**35,104**	**96**
2023	17,687	4,762	3,945	524	242	331	959	1,475	1	5,770	**35,697**	**98**
2024	17,984	4,841	4,012	535	247	338	978	1,507	1	5,872	**36,314**	**99**
2025	18,279	4,919	4,078	544	251	345	996	1,540	1	5,971	**36,925**	**101**
2026	18,572	4,997	4,141	554	256	353	1,013	1,572	1	6,070	**37,530**	**103**
2027	18,868	5,075	4,205	564	260	360	1,031	1,606	1	6,170	**38,139**	**104**
2028	19,161	5,152	4,270	573	265	368	1,049	1,639	1	6,268	**38,746**	**106**
2029	19,453	5,229	4,332	583	269	375	1,066	1,673	1	6,366	**39,347**	**108**
2030	19,754	5,309	4,394	592	273	383	1,083	1,708	1	6,467	**39,963**	**109**
2031	20,042	5,384	4,456	601	278	391	1,100	1,742	1	6,563	**40,558**	**111**
2032	20,345	5,464	4,519	611	282	399	1,117	1,778	1	6,661	**41,177**	**113**
2033	20,664	5,548	4,586	621	287	407	1,136	1,814	1	6,764	**41,828**	**115**
2034	20,974	5,630	4,649	630	291	415	1,153	1,849	1	6,864	**42,456**	**116**
2035	21,274	5,709	4,710	640	295	422	1,170	1,883	1	6,961	**43,065**	**118**
2036	21,593	5,793	4,774	649	300	430	1,188	1,919	1	7,063	**43,710**	**120**
2037	21,904	5,875	4,836	659	304	438	1,205	1,954	1	7,163	**44,337**	**121**
2038	22,215	5,958	4,898	668	308	446	1,222	1,988	1	7,264	**44,967**	**123**
2039	22,537	6,043	4,960	678	313	454	1,239	2,023	1	7,367	**45,614**	**125**
2040	22,870	6,131	5,028	688	317	462	1,258	2,059	1	7,474	**46,287**	**127**
2041	23,205	6,219	5,095	698	322	470	1,277	2,096	1	7,583	**46,964**	**129**
2042	23,535	6,306	5,160	708	327	478	1,295	2,131	1	7,690	**47,631**	**130**
2043	23,861	6,393	5,226	718	331	486	1,313	2,167	1	7,796	**48,292**	**132**
2044	24,185	6,478	5,292	728	336	494	1,332	2,202	1	7,901	**48,948**	**134**
2045	24,508	6,563	5,358	738	341	502	1,350	2,238	1	8,007	**49,605**	**136**
2046	24,839	6,650	5,425	748	345	510	1,369	2,274	1	8,115	**50,276**	**138**
2047	25,172	6,738	5,493	759	350	518	1,388	2,311	1	8,224	**50,954**	**140**
2048	25,507	6,826	5,562	769	355	527	1,407	2,348	1	8,334	**51,638**	**141**
2049	25,843	6,914	5,631	780	360	535	1,427	2,385	1	8,444	**52,320**	**143**
2050	26,173	7,001	5,700	791	365	543	1,446	2,422	1	8,553	**52,995**	**145**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)										
	Single Family	Multifamily	Commercial	Industrial	Irrigation	Other	New Commercial	Self Supplied	NRW	Total	AAD (MGD)
2015	2,535	466	726	1,860	113	30	0	537	1,121	**7,389**	**20**
2016	2,584	471	734	1,885	115	30	0	531	1,141	**7,491**	**21**
2017	2,633	477	739	1,901	116	31	0	525	1,156	**7,578**	**21**
2018	2,683	483	741	1,909	116	31	0	519	1,170	**7,652**	**21**
2019	2,735	489	744	1,920	117	32	0	513	1,182	**7,732**	**21**
2020	2,787	495	747	1,931	117	33	0	507	1,195	**7,813**	**21**
2021	2,842	502	752	1,947	118	33	0	502	1,208	**7,905**	**22**
2022	2,896	508	756	1,962	119	34	0	497	1,222	**7,995**	**22**
2023	2,948	515	762	1,981	120	34	0	492	1,236	**8,088**	**22**
2024	3,003	521	768	2,000	122	35	0	486	1,251	**8,186**	**22**
2025	3,057	528	774	2,020	123	36	0	481	1,266	**8,285**	**23**
2026	3,111	534	781	2,040	124	36	0	476	1,281	**8,383**	**23**
2027	3,165	540	788	2,063	125	37	0	470	1,296	**8,485**	**23**
2028	3,218	547	795	2,085	127	38	0	465	1,311	**8,586**	**24**
2029	3,271	553	803	2,107	128	38	0	460	1,327	**8,687**	**24**
2030	3,325	559	810	2,131	130	39	0	455	1,343	**8,793**	**24**
2031	3,378	565	818	2,155	131	40	0	449	1,358	**8,895**	**24**
2032	3,432	572	827	2,181	133	41	0	444	1,374	**9,004**	**25**
2033	3,490	579	836	2,209	134	41	0	440	1,391	**9,120**	**25**
2034	3,545	585	845	2,236	136	42	0	435	1,408	**9,233**	**25**
2035	3,600	592	854	2,263	138	43	0	430	1,424	**9,344**	**26**
2036	3,658	599	864	2,292	139	43	0	426	1,442	**9,464**	**26**
2037	3,714	606	874	2,321	141	44	0	421	1,459	**9,581**	**26**
2038	3,771	613	883	2,351	143	45	0	416	1,477	**9,699**	**27**
2039	3,829	620	894	2,382	145	46	0	412	1,495	**9,823**	**27**
2040	3,889	627	905	2,415	147	46	0	408	1,515	**9,953**	**27**
2041	3,950	635	917	2,450	149	47	0	404	1,535	**10,087**	**28**
2042	4,011	642	928	2,484	151	48	0	400	1,555	**10,219**	**28**
2043	4,070	650	940	2,520	153	49	0	396	1,575	**10,352**	**28**
2044	4,129	657	952	2,556	155	49	0	392	1,594	**10,486**	**29**
2045	4,188	665	964	2,593	158	50	0	388	1,615	**10,620**	**29**
2046	4,249	672	977	2,630	160	51	0	384	1,636	**10,758**	**29**
2047	4,310	680	990	2,669	162	51	0	380	1,657	**10,899**	**30**
2048	4,371	687	1,003	2,708	165	52	0	376	1,679	**11,041**	**30**
2049	4,433	695	1,016	2,749	167	53	0	372	1,700	**11,185**	**31**
2050	4,493	703	1,030	2,789	170	54	0	368	1,722	**11,328**	**31**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)											
	Single Family	Multifamily	Commercial	Industrial	Municipal	Irrigation	Other	Self Supplied	New Commercial	NRW	Total	AAD (MGD)
2015	4,192	807	615	144	9	206	210	301	1	2,153	**8,637**	**24**
2016	4,273	820	626	147	9	210	214	298	1	2,197	**8,795**	**24**
2017	4,355	833	635	149	9	213	218	295	1	2,237	**8,946**	**25**
2018	4,438	846	641	151	10	216	223	293	1	2,275	**9,092**	**25**
2019	4,527	861	648	153	10	219	228	290	1	2,316	**9,250**	**25**
2020	4,616	875	654	154	10	221	232	288	1	2,355	**9,407**	**26**
2021	4,710	890	661	156	10	224	238	286	1	2,397	**9,574**	**26**
2022	4,803	905	668	158	10	227	243	284	1	2,439	**9,738**	**27**
2023	4,894	920	675	160	11	229	248	282	1	2,480	**9,900**	**27**
2024	4,991	936	682	162	11	232	253	280	1	2,523	**10,071**	**28**
2025	5,087	951	690	164	11	235	259	278	1	2,566	**10,242**	**28**
2026	5,183	966	698	167	11	238	264	276	1	2,609	**10,414**	**29**
2027	5,279	982	706	169	12	242	270	274	1	2,653	**10,588**	**29**
2028	5,375	997	716	171	12	245	276	273	1	2,696	**10,762**	**29**
2029	5,471	1,012	725	174	12	249	282	271	1	2,740	**10,936**	**30**
2030	5,569	1,028	735	176	12	253	288	269	1	2,785	**11,116**	**30**
2031	5,665	1,043	745	179	13	257	294	267	1	2,829	**11,292**	**31**
2032	5,764	1,059	756	182	13	261	300	266	1	2,874	**11,474**	**31**
2033	5,868	1,076	767	185	13	265	306	264	1	2,921	**11,666**	**32**
2034	5,970	1,092	779	188	13	269	312	262	1	2,966	**11,853**	**32**
2035	6,068	1,108	790	191	14	274	318	260	1	3,011	**12,034**	**33**
2036	6,174	1,125	802	194	14	278	324	259	1	3,059	**12,230**	**34**
2037	6,277	1,142	814	198	14	283	330	257	1	3,106	**12,421**	**34**
2038	6,380	1,158	826	201	14	288	336	255	1	3,154	**12,613**	**35**
2039	6,487	1,176	839	204	15	292	342	253	1	3,203	**12,811**	**35**
2040	6,596	1,194	852	208	15	297	349	251	1	3,253	**13,015**	**36**
2041	6,709	1,212	866	211	15	303	355	249	1	3,306	**13,228**	**36**
2042	6,821	1,230	880	215	16	308	362	247	1	3,358	**13,438**	**37**
2043	6,931	1,248	894	219	16	313	368	246	1	3,410	**13,646**	**37**
2044	7,041	1,266	908	223	16	319	374	244	1	3,461	**13,853**	**38**
2045	7,151	1,284	922	226	16	324	381	242	1	3,513	**14,060**	**39**
2046	7,266	1,303	937	230	17	330	387	240	1	3,568	**14,278**	**39**
2047	7,381	1,322	952	235	17	336	394	238	1	3,622	**14,498**	**40**
2048	7,498	1,341	967	239	17	342	401	236	1	3,677	**14,719**	**40**
2049	7,614	1,360	983	243	18	348	408	234	1	3,733	**14,940**	**41**
2050	7,729	1,379	998	247	18	354	415	232	1	3,787	**15,159**	**42**

	PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)									
	Single Family	Multifamily	Commercial	Municipal	Irrigation	New Commercial	Self Supplied	NRW	Total	AADD (MGD)
2015	2,591	234	386	218	33	1	85	1,114	**4,662**	**13**
2016	2,642	238	401	223	35	1	84	1,139	**4,763**	**13**
2017	2,692	242	413	228	36	1	83	1,164	**4,860**	**13**
2018	2,744	247	422	233	37	1	83	1,188	**4,954**	**14**
2019	2,799	251	431	239	38	1	82	1,212	**5,052**	**14**
2020	2,854	256	438	244	38	1	81	1,236	**5,149**	**14**
2021	2,913	260	445	250	39	1	81	1,261	**5,249**	**14**
2022	2,969	265	451	256	40	1	80	1,284	**5,347**	**15**
2023	3,026	270	456	262	40	1	80	1,308	**5,442**	**15**
2024	3,087	275	462	269	41	1	79	1,333	**5,546**	**15**
2025	3,147	279	468	275	41	1	79	1,358	**5,649**	**15**
2026	3,209	284	475	282	42	1	78	1,383	**5,754**	**16**
2027	3,270	289	481	289	43	1	78	1,409	**5,859**	**16**
2028	3,331	294	487	296	43	1	77	1,434	**5,964**	**16**
2029	3,392	299	494	303	44	1	77	1,459	**6,068**	**17**
2030	3,454	304	501	310	45	1	76	1,485	**6,175**	**17**
2031	3,517	309	508	317	45	1	76	1,511	**6,284**	**17**
2032	3,582	314	516	325	46	1	75	1,538	**6,397**	**18**
2033	3,651	320	523	333	47	1	75	1,566	**6,515**	**18**
2034	3,718	325	531	340	48	1	74	1,593	**6,630**	**18**
2035	3,784	331	539	348	49	1	74	1,619	**6,742**	**18**
2036	3,856	337	547	356	49	1	73	1,649	**6,867**	**19**
2037	3,927	342	555	363	50	1	73	1,677	**6,989**	**19**
2038	3,998	348	563	371	51	1	72	1,706	**7,111**	**19**
2039	4,071	354	571	379	52	1	72	1,736	**7,236**	**20**
2040	4,147	360	580	387	53	1	71	1,767	**7,365**	**20**
2041	4,226	367	589	396	54	1	70	1,799	**7,502**	**21**
2042	4,305	373	597	404	54	1	70	1,832	**7,637**	**21**
2043	4,383	380	606	413	55	1	69	1,863	**7,771**	**21**
2044	4,461	386	615	421	56	1	69	1,895	**7,904**	**22**
2045	4,538	393	624	429	57	1	68	1,927	**8,037**	**22**
2046	4,621	399	633	438	58	1	68	1,962	**8,181**	**22**
2047	4,705	406	643	448	59	1	67	1,996	**8,325**	**23**
2048	4,789	413	652	457	60	1	67	2,031	**8,469**	**23**
2049	4,873	420	662	466	61	1	66	2,065	**8,614**	**24**
2050	4,956	427	672	475	62	1	66	2,099	**8,757**	**24**

PROJECTED WATER USE (MILLIONS OF GALLONS PER YEAR)

	Single Family Reside	i Family Reside	Commercial	Institutional	Industrial	Irrigation	Other	Self Supplied	lew Commercia	NRW	Total	AAD (MGD)
2015	1,901	214	497	58	86	53	354	235	1	1,401	**4,800**	**13**
2016	1,926	217	512	58	89	55	359	233	1	1,421	**4,869**	**13**
2017	1,952	219	523	59	91	56	364	230	1	1,441	**4,935**	**14**
2018	1,977	221	530	60	92	57	369	228	1	1,461	**4,997**	**14**
2019	2,004	223	537	61	94	58	374	225	1	1,480	**5,058**	**14**
2020	2,031	226	543	62	95	59	380	223	1	1,499	**5,118**	**14**
2021	2,060	228	549	63	96	60	386	221	1	1,518	**5,181**	**14**
2022	2,088	231	554	64	98	60	392	219	1	1,536	**5,241**	**14**
2023	2,116	233	559	65	99	61	398	217	1	1,554	**5,301**	**15**
2024	2,143	235	564	66	100	62	404	215	1	1,571	**5,359**	**15**
2025	2,169	238	569	67	101	62	410	213	1	1,588	**5,417**	**15**
2026	2,195	240	574	68	102	63	416	211	1	1,604	**5,472**	**15**
2027	2,220	242	578	69	103	64	422	208	1	1,621	**5,528**	**15**
2028	2,246	244	584	70	104	64	428	206	1	1,637	**5,584**	**15**
2029	2,271	246	589	71	105	65	434	204	1	1,653	**5,639**	**15**
2030	2,297	249	594	72	106	66	441	202	1	1,671	**5,698**	**16**
2031	2,319	250	599	73	107	66	446	200	1	1,685	**5,747**	**16**
2032	2,343	252	603	74	108	67	452	198	1	1,700	**5,799**	**16**
2033	2,369	255	609	75	109	67	458	197	1	1,716	**5,855**	**16**
2034	2,393	257	613	76	110	68	464	195	1	1,731	**5,908**	**16**
2035	2,417	259	618	77	111	69	470	193	1	1,745	**5,959**	**16**
2036	2,440	261	623	78	112	69	475	191	1	1,760	**6,009**	**16**
2037	2,462	263	627	78	113	70	481	189	1	1,774	**6,057**	**17**
2038	2,485	264	631	79	114	70	486	187	1	1,787	**6,105**	**17**
2039	2,508	267	635	80	115	71	491	185	1	1,802	**6,155**	**17**
2040	2,533	269	640	81	116	72	497	184	1	1,817	**6,209**	**17**
2041	2,556	271	645	82	117	72	502	182	1	1,832	**6,260**	**17**
2042	2,579	273	649	83	118	73	507	180	1	1,846	**6,309**	**17**
2043	2,602	275	653	84	119	73	512	179	1	1,860	**6,358**	**17**
2044	2,624	277	658	84	120	74	517	177	1	1,874	**6,407**	**18**
2045	2,647	278	662	85	121	75	523	175	1	1,889	**6,455**	**18**
2046	2,669	280	666	86	122	75	528	174	1	1,903	**6,503**	**18**
2047	2,691	282	671	87	123	76	533	172	1	1,917	**6,552**	**18**
2048	2,714	284	675	88	124	76	538	170	1	1,931	**6,601**	**18**
2049	2,737	286	679	89	124	77	543	169	1	1,945	**6,650**	**18**
2050	2,759	288	683	89	125	78	548	167	1	1,959	**6,698**	**18**

Georgia Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr. Drive, Suite 1456, Atlanta, Georgia 30334
Judson H. Turner, Director
(404) 656-4713

MEMORANDUM

TO: Judson H. Turner, Director

FROM: Nap Caldwell, Water Supply Section

SUBJECT: 2050 Water Needs of Dawson, Habersham, Lumpkin and White Counties

DATE: December 2, 2015

Please find attached a document entitled "Projected 2050 Water Needs of Dawson, Habersham, Lumpkin and White Counties, and Amount Likely Sourced to Lake Lanier." The document was prepared in the course of the staff's re-evaluation of projected 2050 water supply requirements that might be placed on Lake Lanier by the referenced counties. The re-evaluation takes into consideration the most recent 2050 population projections as produced by the Office of Planning and Budget, the best currently available data and information on per capita water use within the water service boundaries of water utilities within the respective counties, and the supplies currently available from non-Lake Lanier sources in those counties. In summary, our re-evaluation of water needs indicates that approximately 8 million gallons per day (mgd) are estimated to be needed from Lake Lanier in 2050 to meet the water needs that cannot reasonably be met from sources currently available to these four counties.

Attachment/

Projected 2050 Water Needs of Dawson, Habersham, Lumpkin and White Counties, and Amount Likely Sourced to Lake Lanier

Dawson County

- In 2015 the Office of Planning and Budget (OPB) projected a 2050 population of 40,003. This figure reflects an expected 17,673 increase over the 2010 US Census Bureau population of 22,330.
- In 2014 per capita water use amongst the facilities with Safe Drinking Water and water withdrawal permits was approximately 72 gpcd county-wide. This reflects a consistent decrease in county-wide per capita water use over the previous several years (e.g., 83 gpcd in 2012, 79 gpcd in 2013, and 72 gpcd in 2014). *This is based upon an October 2015 in-house investigation conducted by a team of Water Supply Section associates (for 144 counties in Georgia) using data submitted to EPD (as required by permit conditions) since 2010. These data were also used to estimate per capita water use for the remaining three counties.*
- While this 72 gpcd is already comparatively small, it also takes into account the almost 7 million annual non-resident water users frequenting the Tanger outlet mall on the north end of GA400 in Dawson County.
- Unless there is an even greater future play in industrial and/or commercial water use vis-à-vis domestic uses, tourism related water use, or other non-base population water use in the county over the next 35 years, it is reasonable to assume the per capita water use will likely stay in the 70-85 gpcd range save for modest changes having to do with continued water conservation efforts. If there is a significant uptick in these other uses, it could have a proportionate uptick impact on per capita as the base population is quite modest. Conclusion: Use an 80 gpcd figure with a 15% uncertainty factor for 2050, yielding 92 gpcd (i.e., 3.68 mgd)
- On the supply side, there's currently 0.50 mgd of permitted groundwater withdrawal in Dawson County, and it is anticipated that this supply will continue to be available at 2050. Additionally, there is currently 4.4 mgd of M&I withdrawal permitted in the county, and more than twice as much as that might become available if the proposed Russell Creek reservoir is granted a 404 permit. No 2050 deficit is expected to exist in Dawson County.

Habersham County

- In 2015 OPB projected a 2050 population of 64,860 for Habersham County. This estimate reflects an expected 20,307 increase over the 2010 US Census Bureau population of 44,553.
- In 2014 per capita water use amongst facilities with Safe Drinking Water and water withdrawal permits was approximately 174 gpcd county-wide. This relatively high number was partially driven by a per capita amount of some 445 gpcd for the City of Cornelia. This very high per capita rate for Cornelia is explained by the fact that the city

sells approximately 80% of its finished water to Fieldale Farms (in 2014 this represented 0.80 x 2.73 mgd ~ 2.18 mgd), a large poultry processing plant. Cornelia's residential per capita water use is approximately 55 gpcd, and if the county use rate were adjusted for the obvious skewing resulting from service to Fieldale Farms [i.e., (5.86 mgd – 2.18 mgd) / 33705], the resulting per capita use rate of 109 gpcd would represent a reasonable figure. However, one cannot discount the continued existence of Fieldale Farms, therefore there is a need to add 2 to 3 mgd to the population-based total 2050 needs.

- Gross 2050 need would therefore be as follows: [(109 x 64,860) x 1.15] + 3 mgd = 11.13mgd.
- On the supply side, there is 2.25 mgd (monthly avg) of permitted groundwater withdrawals in Habersham County, and it is assumed that this will continue to be available at 2050. There's 8 mgd of permitted M&I surface water withdrawal in the county, and it's safe to assume that at least this amount of permitted withdrawal will exist in 2050. The 2050 deficit is therefore ~ 0.88 mgd.

Lumpkin County

- In 2015 OPB projected a 2050 population of 44,201 for Lumpkin County. This estimate reflects an expected 14,235 increase over the 2010 US Census Bureau of 29,966.
- In 2014 per capita water use amongst facilities with Safe Drinking Water and water withdrawal permits was approximately 225 gpcd county-wide. While this is an admittedly high number, when consideration is given to the huge impact of Dahlonega's non-resident tourism and the presence of a branch of the University of North Georgia campus (much of which is also likely to be non-resident), this figure is not thought to be unreasonable. It is not unreasonable to assume continuation of the tourism influence on water use, and it is perhaps reasonable to assume that the non-resident student population may continue to grow vis-à-vis the resident population. Assuming a 200 gpcd figure for 2050 then results in a gross need of [(44,201 x 200) x 1.15] = 10.17 mgd.
- On the supply side, there are currently no permitted groundwater withdrawals in Lumpkin County, however the safe yield of the Yahoola Creek Reservoir is 5.7 mgd (*note that the Corps reports a Yahoola Creek reservoir yield of 25.5 mgd on page 2-49 of its ACF DEIS, but we can only substantiate 5.7 mgd of that from 404 records and our withdrawal permit*). The 2050 deficit is therefore ~ 4.47 mgd.

White County

- In 2015 OPB projected a 2050 population of 35,839 for White County. This estimate reflects an expected 9,135 increase over the 2010 US Census Bureau total of 26,704.
- In 2014 per capita water use amongst facilities with Safe Drinking Water and water withdrawal permits was approximately 138 gpcd county-wide. This use rate is likely influenced to the upside by the non-resident water use associated with tourism and conference business generated by the City of Helen. Let's leave the figure at 138 gpcd as the influence isn't likely to wane with an increase in resident population. The resulting 2050 gross demand is therefore [(35839 x 138 gpcd) x 1.15] = 5.69 mgd.

- On the supply side, there's currently 1.24 mgd (monthly average) of permitted groundwater in White County. No reason to think this availability will decrease. There's currently 1.8 mgd of permitted surface water (Turner Creek), but safe yield is 2 mgd. Total available currently is therefore 3.24 mgd, which suggests a current 2050 deficit of approximately 2.45 mgd.

Total 4-county estimated 2050 water supply need (0 + 0.88 + 4.47 + 2.45) is approximately 7.8 mgd.

Appendix B: Georgia Water Supply Alternatives – Response to U.S. Army Corps of Engineers RFI

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Georgia Department of Natural Resources
Environmental Protection Division
2 Martin Luther King Jr., Drive, Suite 1456 East Tower, Atlanta, Georgia 30334
Judson H. Turner, Director
(404) 656-4713

May 30, 2014

BY ELECTRONIC MAIL AND U.S. MAIL
Colonel Jon J. Chytka, Commander
U.S. Army Corps of Engineers, Mobile District
P.O. Box 2288
Mobile, AL 36628

Re: Corps of Engineers' Request for Additional Information for the State of Georgia's January 11, 2013 Water Supply Request

Dear Colonel Chytka:

I am writing in response to your February 11, 2014 request that the State of Georgia provide additional information to supplement the information provided in Governor Nathan Deal's letter dated January 11, 2013, which updated Georgia's 2000 request for releases from Buford Dam to supply 408 million gallons per day (mgd) for downstream water supply users and reallocation of storage in Lake Lanier to provide for direct withdrawals of 297 mgd. Your request sought the following: (1) historical water use data for the past 10 years; (2) economic data for certain "contingency options;" and (3) operational scenarios for the proposed Glades Reservoir. The State of Georgia's responses to your request are included below.

Historical Water Use Data

Attachment A provides the historical water use data for the latest available ten years by water supplier in the requested data format. Your letter states that the Corps will use this information "to examine water demand elasticity for the communities/counties that currently use Lake Lanier or are anticipated to become future users." Although Georgia is supplying the data as requested, please note that there are additional factors that might affect your analysis.

Specifically, the Metropolitan North Georgia Water Planning District's (Metro Water District) Water Supply and Water Conservation Management Plan includes strategies and recommendations for water supply management and includes twelve measures for local governments to adopt. One such measure is that conservation pricing be used by all Metro Water District drinking water supply utilities. All Metro Water District water utilities have implemented at least a three-tiered rate structure. Thus, demand reduction benefits from using price elasticity to moderate demand have been largely realized. If you require additional information in this regard, please do not hesitate to let us know.

Economic Data for Water Supply Options

Your February 11, 2014 letter requests that Georgia provide detailed economic information regarding certain "contingency options" found in the 2009 Water Task Force Report that the State would likely consider in "the event that Lake Lanier were unavailable for certain withdrawals." In addition, it is our understanding the Corps has asked that the Atlanta Regional Commission provide location and sizing information for certain water supply projects that are currently in the permitting process.

In our view, neither form of inquiry would yield the most appropriate framework for the economic evaluation of alternatives to the State's water supply request.

First, it would not be appropriate for the Corps to consider as water supply alternatives any of the specific projects discussed in the 2009 Water Task Force Report. As discussed below, Georgia has re-examined the types of water resource projects that would be needed to provide water supply to those jurisdictions that currently or in the future are projected to withdraw water directly from Lake Lanier. Based upon that analysis, Georgia has more directly responsive and accurate information than what is contained in the 2009 Water Task Force Report. Under present circumstances the State would not necessarily endorse any of the projects listed in the 2009 Report. Therefore, it is not reasonable for Georgia to speculate as to which specific project it "would likely implement" to meet future water supply needs in the unlikely event the Corps denies Georgia's water supply request.

Second, it would also be inappropriate for the Corps to include as water supply alternatives projects that are already in the permitting process. These projects are currently scheduled to be constructed regardless of whether the Corps grants Georgia's water supply request. These projects are necessary to meet Georgia future water supply needs in addition to the water supply needs to be met by the water supply request. Also, several of the projects currently in the permitting process are outside the Apalachicola-Chattahoochee-Flint ("ACF") River Basin and are therefore inappropriate for consideration as alternatives to meeting water supply needs inside the ACF River Basin.

Accordingly, and to be as responsive to your request as possible, the State has prepared what we believe is a more useable form of alternatives analysis, a copy of which is attached as Attachment B. As you can see, this analysis relies upon two general premises:

(1) It is not practicable to locate any alternative project for purposes of doing a location-specific economic analysis. Identifying a location for a project requires analysis of countless economic, environmental, and political factors, all of which can create substantial swings in project costs, such that proposing a hypothetical location for a project not currently under consideration renders the resulting analysis so detached from actual, likely costs that the resulting conclusions are not reliable. Therefore, the most meaningful cost analysis that can be done under the present circumstances is evaluation of conceptual, non-specific projects.

(2) The most reliable economic data for use in estimating project costs is that obtained from recently completed and currently planned projects. Again, theoretical values for hypothetical construction details simply do not yield meaningful estimated project costs. Using these costs

creates a range of cost per mgd that would be obtained through the construction of a new reservoir project. Please note that the ranges present in the attached memo represent the low end cost of providing the necessary water supply storage, and the cost of alternative water supply storage could be higher than the estimates in the memo.

Based upon these premises, we have calculated the range of costs for alternatives to water supply allocation from Lake Lanier. Those costs, under several different possible scenarios, along with associated infrastructure costs, are detailed in Attachment B. Again, if you have any questions regarding the attached alternatives analysis, or require further information in that regard, do not hesitate to let us know.

Operational Scenarios for Glades Reservoir

In your February 11, 2011 letter, you request "clarification of potential operational scenarios for the operation of the proposed Glades Reservoir with and without reallocation." As noted in the January 11, 2013 supplement to the water supply request, the State of Georgia projects a 30-40 mgd yield from the Glades Reservoir. As currently proposed, water supply releases from Glades Reservoir will be withdrawn through existing water supply intakes in Lake Lanier. Because the withdrawals from Lake Lanier would be equivalent to the releases from the Glades Reservoir to Lake Lanier, no storage should be required for the withdrawal of that water.

At this time, the State of Georgia is aware of no proposed set of alternative operations for Glades Reservoir in the unlikely event that the Corps denies, in whole or in part, Georgia's water supply request. Should the Corps deny the water supply request, the State will work with the project sponsors to determine whether the project will go forward and, if so, how the project would be operated.

Please let me know if I can be of further assistance in this matter.

Sincerely,

Judson H. Turner
Director

Attachment A

Forsyth	Average Daily Use (mgd)										
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	comments
Residential	7.37	8.11	8.17	8.88	8.02	7.31	9.6	10.09	8.07	7.44	
Multi-family Residential											user group not available
Commercial	1.58	1.71	1.62	1.55	1.41	1.4	1.6	1.96	1.4	1.38	
Industrial											user group not available
Institutional											user group not available
Other (Fireline & Hydrant)	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.05	0.04	0.02	
Other (Irrigation)	0.35	0.56	0.66	0.62	0.4	0.22	0.93	0.84	0.64	0.6	
Other (sold to other municipalities)	0.03	0.08	0.05	0.08	0.04	0.06	0.1	0.1	0.18	0.15	
Total	9.34	10.47	10.51	11.14	9.88	9	12.26	13.04	10.33	9.59	

Buford	Average Daily Use (mgd)										
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	comments
Residential	0.47	0.49	0.48	0.5	0.5	0.49	0.58	0.58	0.61	0.6	
Multi-family Residential											user group not available
Commercial	0.34	0.39	0.38	0.4	0.36	0.42	0.48	0.45	0.43	0.41	
Industrial											user group not available
Institutional											user group not available
Total	0.81	0.88	0.86	0.9	0.86	0.91	1.06	1.03	1.04	1.01	

Cumming	Average Daily Use (mgd)										
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	comments
Residential	2.81	2.6	3.27	3.13	2.91	2.71	3.26	3.11	2.72	2.58	
Multi-family Residential											user group not available
Commercial	0.73	0.66	0.78	0.71	0.71	0.66	0.94	1.05	0.87	0.9	
Industrial	1.36	1.2	1.25	1.33	1.18	1.09	1.24	1.37	1.41	1.49	Tyson, Koch, and Northside Foods
Institutional											user group not available

Other (Irrigation, Senior, firelines, etc.)	0.19	0.19	0.03	0.05	0.11	0.06	0.09	0.13	0.26	0.27	
Other (sold to other municipalities)	1.15	3.32	4.53	4.4	4.45	5.12	4.55	4.55	4.38	4.52	
Total	6.24	7.97	9.86	9.62	9.36	9.64	10.08	10.21	9.64	9.76	

Gainesville	Average Daily Use (mgd)										
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	comments
Residential	7.09	7.4	7.72	7.76	7.42	7.41	7.93	7.31	7.36	7.64	
Multi-family Residential	1.26	1.28	1.28	1.29	1.3	1.31	1.35	1.3	1.26	1.11	
Commercial	1.86	1.97	2.05	2.05	2.02	1.99	2.25	2.35	2.43	2.5	
Industrial	5.46	5.69	5.86	5.75	5.4	5.2	6.98	7.8	6.5	6.09	
Institutional	0.42	0.45	0.47	0.47	0.46	0.45	0.51	0.53	0.57	0.65	NOTE: Institutional not available 2006-13, pulled out of commercial based on the ratio (18.5%) in the 2004/2005 data
Other (Irrigation)	0.31	0.35	0.36	0.28	0.17	0.22	0.4	0.37	0.34	0.36	NOTE: Irrigation category not available in 04/05, pulled out of commercial based on ratio (12.7%) from 2006-13 data
Total	16.4	17.14	17.74	17.6	16.77	16.58	19.42	19.66	18.46	18.35	

Gwinnett	Average Daily Use (mgd)										
	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	comments
Residential	43.85	45.1	47.59	47.29	45.79	46.05					user group not available prior to 2008
Multi-family Residential											user group not available
Commercial	11.15	11.88	12.04	13.35	12.1	13.35					user group not available prior to 2008
Industrial											user group not available

Institutional (Governmental)	1.36	1.32	1.31	2.24	1.85	2.01					user group not available prior to 2008
Other (Wholesale)	1.87	2.55	2.6	2.82	2.98	3.71					user group not available prior to 2008
Other	5.62	10.86	10.89	9.04	8.56	6.77					Difference between finished water record and metered consumption
Total	63.85	71.71	74.43	74.74	71.28	71.89	86.84	87.41	80.65	82.67	

Attachment B

Memorandum

To: Judson Turner, Director

From: Wei Zeng, Hydrology Unit

Date: May 30, 2014

Subject: Response to Army Corps of Engineers request for additional information dated February 11, 2014 regarding water supply alternatives to reallocation at Lake Lanier

Introduction

By letter dated February 11, 2014, the Mobile District of the U.S. Army Corps of Engineers asked for additional information regarding Georgia's Water Supply Request for Lake Lanier (the Georgia Request). In the Georgia Request, the Governor of Georgia has asked the Corps to reallocate storage in Lake Lanier to provide for direct withdrawals from Lake Lanier of 297 mgd and make releases from Lake Lanier to satisfy a water supply need of 408 mgd in the Chattahoochee River downstream of Buford Dam. The Corps seeks information on the "emergency options" that were discussed in the 2009 Water Contingency Planning Task Force Report (Task Force Report) as water supply alternatives that the State might have to pursue if it were cut off from water supply from Lake Lanier.

The State of Georgia is not planning to implement any alternatives to the water supply that currently is and in the future could be provided by Lake Lanier. Lake Lanier is by far the most cost-effective and environmentally protective alternative for the supply of water to those metro governments located around and downstream of it. But, to respond to the Corps' inquiry, we can provide information in response to the question of which alternatives Georgia would be likely to pursue in the unfortunate and unlikely event that Lake Lanier was not available.

In response to the Corps' letter, Georgia EPD has re-examined the types of water resource projects, namely large non-federal reservoirs or large pumping and piping facilities, that would be needed to provide water supply to those jurisdictions that currently or in the future are projected to withdraw water directly from Lake Lanier. Based upon that analysis, we have more directly responsive and accurate information than the 2009 Task Force Report with which to respond to the Corps' question about alternatives.

Before discussing our methodology, it is important to note that we cannot assess whether the new water supply projects contemplated in this memorandum, particularly the reservoirs, could actually be permitted and constructed; nor can we assess fully at this time what the environmental effects of them would be. That would require actually planning, designing and attempting land acquisition and permitting of the projects. Thus, the State of Georgia cannot guarantee (and the Corps should not assume) that the projects discussed in this report would be available to fill any gap in demand between the State of Georgia's needs and supplies available from Lake Lanier. Assuming that the identified projects could be built, however, we are able to make general estimates of their cost.

The analysis provided in this memo concerns only water supply alternatives for those users that will rely on direct withdrawals from Lake Lanier. It is our understanding that these were the waters supply users about which the Corps most desired information regarding alternatives for the emergency or worst-case scenario in which Georgia's Request were denied. Georgia plans to develop a similar analysis for users that withdraw water from the Chattahoochee River and are dependent on releases from Lake Lanier to make those withdrawals. We will provide you with that analysis when it is available.

Also, we have assumed that the Corps desires information about what are likely to be the least-cost alternatives (though none are low cost by any means) and not necessarily which options could be implemented most quickly. The Task Force Report concluded that alternatives could not be implemented in a three-year period that would fill the shortfall that would have resulted were Judge Magnuson's 2009 ruling actually upheld. That continues to be the case; three years, or probably even five or more, would not be time to implement alternatives that would effectively fill the shortfall that would be created if direct withdrawals from Lake Lanier were not allowed. As imposing an arbitrary and unnecessarily short deadline for Georgia to develop alternatives would only worsen an ill-advised decision not to allow storage in Lake Lanier to be used for direct water supply withdrawal, we have not assumed that such a deadline would be imposed.

Analysis

We have analyzed two scenarios; each assuming that the Corps declines to allocate storage in Lake Lanier to meet Georgia's projected 2040 needs for direct water withdrawals from Lake Lanier (estimated to be 297 mgd). The first scenario assumes that the Corps allocates storage to meet existing levels of water withdrawal (as represented by 2011 data) but declines to allocate storage to meet demands beyond that level. The second scenario assumes that the Corps declines to allocate any storage for direct water supply withdrawals from Lake Lanier beyond the 20 mgd assured by relocation contracts and the 1956 legislation providing storage for Gwinnett County.

For each of the scenarios presented below, we estimate the financial costs associated with what would appear to be the most likely alternatives based on the best information available to us at this time and given the time constraints associated with the Corps' request. In the unlikely and unfortunate event that Lake Lanier would not be available to meet the water supply needs of the local jurisdictions that now or are projected to withdraw directly from Lake Lanier, we anticipate generally that alternatives would involve construction of either new non-federal water supply reservoirs and associated transmission pipelines and other infrastructure, or construction of the infrastructure necessary to pump water from the Chattahoochee River below Lake Lanier and transport it up to users above Lake Lanier. As stated above, the alternative reservoirs are generic and do not represent any project that is currently planned or that has been proposed, and it might not even be possible to obtain federal and state regulatory approvals for them or construct them.

We obtained our data on completed and proposed reservoirs from two types of sources. One is the Georgia Environmental Finance Authority, the state agency that assists in the financing of projects of this type. The other is the local water systems that have developed, or are developing, water supply reservoirs.

It is important to note the various factors indicating that our estimates should be viewed as a lower-bound. For one, as-built project cost data are not published, and we do not assume that such data encompasses all of the actual costs associated with the project. Additionally, there are several reasons to believe that future projects will be more expensive than similar past projects, including inflation generally, increasing scarcity of suitable land, and increasingly stringent environmental regulations (such as instream flow standards that went into effect in 2001, and measures to protect water quality and federally-protected species). Another significant reason to believe that future projects will be more expensive is the need to ensure that the safe yield determinations of future reservoirs reflect the occurrences of the historically severe 2007-2008 drought, which will in turn reduce the safe yield of future projects and require larger reservoirs to meet anticipated future demands.

Scenario 1

In this scenario, we assume that the Corps allocates storage to meet only the existing level of direct withdrawals from Lanier, but no more (i.e., 115 mgd). This would leave a water supply deficit of roughly 182[1] mgd (on an annual average daily flow basis) reflecting the combined

[1] The projected 2040 water supply needs of all users who currently or in the future are projected to withdraw water from Lake Lanier. The sum of these needs is 298 mgd, including 257 mgd projected for City of Gainesville, Forsyth County, City of Cumming, Gwinnett County, and City of Buford, and 41 mgd for entities in Dawson, Lumpkin, White, and Habersham Counties. With a recorded water withdrawal of 115 mgd directly from the lake by existing users in 2011, the increment toward the projected 2040 needs is 183 mgd, as illustrated by Figures 2

water supply needs (beyond 2011 levels of withdrawal) of City of Cumming, Forsyth County, City of Buford, Gwinnett County Water & Sewerage Authority, and City of Gainesville. We contemplate two sub-scenarios, 1A and 1B, representing two different generic alternatives for meeting the needs that would not be provided by direct withdrawal from Lake Lanier.

Sub-Scenario 1A

In this sub-scenario, we make the assumption that a set of water supply reservoirs would need to be developed upstream of Lake Lanier. The location, size, pump capacity, hydrologic information, and safe yield for any individual reservoir cannot be determined without a much more detailed study that would accompany actual pursuit of such an option (in the unfortunate and unlikely event the option were needed).

At this time, we can make only very general assumptions in estimating the total cost of the necessary water supply reservoirs. As discussed above, we estimated the cost of reservoirs generally based upon as-built costs for completed reservoirs and projected costs of reservoirs that have been proposed.

Table 1 contains information for seven water supply reservoirs developed in Georgia since 1999. Safe yields of these projects have been obtained from EPD permit files. The cost of developing each project per million gallons of water per day (mgd) of safe yield (i.e., "unit cost") then was determined. Unless otherwise noted, the 'Total Project Costs' in the table reflect land costs and wetlands mitigation costs but do not include water treatment plant costs if such a plant would be needed in association with development of the reservoir. We also note that those safe yields shown in Table 1 may not take into account the 2007-2008 drought, and may therefore over estimate actual safe yield. To the extent that current safe yields are lower than assumed here, the cost per mgd of safe yield would be higher than shown in Table 1.

According to the information compiled in Table 1, the unit cost (expressed in mgd of safe yield) of developing water supply reservoirs has been increasing steadily, from roughly a half million dollars to $1.8 million per mgd in 1999, to $2.8 million in 2007. This increase also can be seen in Figure 1. As noted above, this is likely the result of multiple factors.

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through 5 of this memorandum. Georgia's Request asks the Corps to allocate storage to meet 297 mgd of water supply needs. The increment between the current level of withdrawal and this requested amount is 182 mgd.

Table 1 - Costs of Completed Water Supply Reservoirs in the Past 15 Years

Reservoir Name	River Basin	Year of Completion	Safe Yield (MGD)	Total Project Cost	Cost per MGD of Safe Yield
Yellow Creek Reservoir	Coosa	1999	33	$16,171,200[2]	$0.49 million
Towaliga Reservoir	Ocmulgee	1999	13.7	$24,694,278[3]	$1.8 million
Snake Creek Reservoir	Chattahoochee	2001	13.5	$19,302,400[4]	$1.4 million
Bear Creek Reservoir	Oconee	2002	53	$37,669,168[5]	$0.71 million
Yahoola Creek Reservoir	Chattahoochee	2002	5.7	$13,226,221[6]	$2.3 million
Still Branch Reservoir	Flint	2006	35	$38,300,000[7]	$1.1 million
Hickory Log Creek Reservoir[8]	Coosa	2007	36	$99,000,000[9]	$2.8 million

[2] Source: Cherokee County Water & Sewerage Authority.
[3] Source: Henry County Water & Sewer Authority.
[4] Source: Carroll County Water Authority.
[5] Source: Upper Oconee Basin Water Authority.
[6] Source: Georgia Environmental Finance Authority, Georgia Fund Load Increase memorandum, August 22, 2001.
[7] Source: City of Griffin Public Works.
[8] The safe yield and total cost for Hickory Log Creek Reservoir shown in Table 1 are based on the assumption that, per the State of Georgia's January 30, 2013 request for the reallocation of storage for water supply in Lake Allatoona, Cobb County-Marietta Water Authority (CCMWA) is permitted to replenish its current storage account in Lake Allatoona with 100% of the water supply releases made from the Hickory Log Creek Reservoir for the benefit of CCMWA. If CCMWA is unable to operate Hickory Log Creek Reservoir in this manner, the safe yield and

The steady increase in unit cost of developing water supply reservoirs also is reflected in the latest cost estimates of reservoir projects that are under development or going through various stages of regulatory review. Table 2 contains information of three such reservoirs. Presently, the unit cost of developing water supply reservoirs in Georgia has been estimated by those involved in planning them as between $2.2 million and $6.2 million per mgd. (Note that these cost estimates do not include costs for building water treatment plants.) The trend of increases in unit cost of developing water supply reservoirs can be seen in Figure 1.

Table 2 - Estimated Costs of Proposed Water Supply Reservoirs

Reservoir Name	River Basin	Safe Yield (MGD)	Total Project Cost	Cost per MGD of Safe Yield
Indian Creek Reservoir	Tallapoosa	18	$112 million[10]	$6.2 million
Richland Creek Reservoir	Coosa	35	$75.7 million[11]	$2.2 million
Glades Reservoir[12]	Chattahoochee	30 to 40	$129.9 million	$3.2 million to $4.3 million
Hard Labor Creek Reservoir	Oconee	41.4	$134.9 million[13]	$3.3 million

Because the cost ranges in Table 2 are more recent, are consistent with the trend of increasing cost since 1999, are more likely to reflect the effects of recent droughts on safe yields, and account at least to some degree for increasingly stringent environmental requirements, the costs per mgd in Table 2 probably are closer to representing current costs, but even they likely

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estimated cost of the reservoir will be significantly different, and the total cost per mgd for Hickory Log Creek Reservoir will likely be much higher than the number shown in Table 1.

[9] Source: Cobb County Marietta Water Authority.

[10] Source: Carroll County Water Authority.

[11] Source: Georgia Environmental Finance Authority, Georgia Reservoir and Water Supply Fund Loan Memo, Governor's Water Supply Program, August 1, 2012.

[12] The safe yield and total cost for Glades Reservoir shown in Table 2 are based on the assumption that water supply releases from Glades Reservoir will be withdrawn from existing intake structures in Lake Lanier. If Glades Reservoir cannot be operated in this manner, the safe yield and estimated cost of the reservoir will be significantly different, and the total cost per mgd for Glades Reservoir will likely be much higher than the number shown in Table 2.

[13] Source: Walton County.

understate what the actual cost of the generic reservoirs that are assumed in this scenario for reasons discussed above. Thus, if one uses the range associated with the estimated cost of proposed reservoirs ($2.2 million to $6.2 million per mgd of water supply development), the range of cost for reservoir construction to address a water supply deficit of 182 mgd would be between **$400 million** and **$1.13 billion but could be significantly higher on account of factors discussed in this memorandum**.

In addition, for water stored in the water supply reservoirs to reach the designated users, pipelines and pump stations would have to be constructed. Figure 2 shows a potential reservoir and pipeline configuration for Sub-Scenario 1A. We assumed two sets of pipelines connecting the two generic reservoirs to the existing water treatment plants of the anticipated water supply providers. On the east side of Lake Lanier, we assumed a water supply reservoir (USR1) and a set of pipelines connecting this reservoir to the water treatment plants entities such as Hall County, City of Gainesville, Gwinnett County, and City of Buford. On the west side of Lake Lanier, we assumed another water supply reservoir (USR2) and a second set of pipelines connecting this reservoir with entities such as Forsyth County, City of Cumming, Dawson County, Lumpkin County, White County, and Habersham County. Because of the uncertainty in the spatial location of either water supply reservoir and the potential safe yield at individual reservoirs, we assumed a bidirectional pipeline connecting the two sets of pipes, in the event there were a need for one of the pipelines to provide water to users that are projected to receive water from the other pipeline.

To estimate the cost of piping and pump station construction, we consulted the engineering firm of Brown and Caldwell, which was involved in the development of a portion of the 2009 Task Force Report dealing with potential indirect potable reuse options. Brown & Caldwell created a spreadsheet tool in estimating total piping cost (capital investment and operation and maintenance cost – O&M) of transporting large amounts of water over long distances. Brown & Caldwell has provided the most updated Construction Cost Index, which is used in determining construction cost of pipelines in the spreadsheet tool.

Locations of existing water supply entities are identified by the 2009 Task Force Report. Locations of future water supply providers in Dawson, Lumpkin, White, and Habersham Counties are unknown at this time, and are assumed to be at the current population centers in these counties. Distances between different water supply providers were obtained either from the 2009 Task Force Report or from a direct measurement on a scale 1:500,000 Hydrologic Unit Map developed by United States Geological Survey (USGS). Topographic elevations of water supply providers were obtained from the 2009 Task Force Report or from a direct reading of a Google Earth map. Figure 2 shows the compilation of such information.

Since the exact locations of USR1 and USR2 are unknown at this time, we assumed that they are within a 3-mile distance of the existing Forsyth and Buford water treatment plants. We also assumed that the normal elevation of the reservoirs will be the same as the elevation of Forsyth or Buford, so the static pumping head between the water supply reservoirs and the receiving points is zero. If the elevation is different or the distance is farther than three miles, this could increase the cost, possibly significantly.

Using the Brown & Caldwell tool and the above information, we estimated the size and total project cost, including initial capital investment and a 20-year O&M, of each pipeline. As the size of the pipes change, so do the initial capital investment and the O&M. Through trial and error, a minimum total project cost for each pipeline was estimated. The pipeline sizes and associated costs for all pipelines are shown in Figure 2. The total piping and pumping cost of Sub-Scenario 1A is thus estimated to be **$717 million but could be significantly higher on account of factors discussed in this memorandum**.

When combined with the cost for reservoir construction, the estimate for the cost of Sub-Scenario 1A is between **$1.12 billion** and **$1.85 billion but could be significantly higher on account of factors discussed in this memorandum**.

Sub-Scenario 1B

Another alternative that is at least theoretically possible in the unfortunate and highly unlikely event that Lake Lanier were not available to meet current and projected needs, would be for local governments to attempt to fill the gap of 182 mgd by withdrawing that quantity of water from the Chattahoochee River downstream of Buford Dam. In this alternative, we assume that no water supply reservoir would be constructed, and instead that the water supply providers that would otherwise withdraw water from Lake Lanier would install intakes in the Chattahoochee River below Lake Lanier and pump water (uphill) to those providers.

The cost of this option would result from piping systems and associated pump stations. We have assumed the location of the pump station to be Georgia Power Company's Morgan Falls Dam. A potential piping configuration is shown in Figure 3.

We assumed an eastern pipeline carrying water to meet the water supply needs of Gwinnett County, City of Buford, Hall County, and City of Gainesville, and a western pipeline to meet the needs of Forsyth County, City of Cumming, Dawson County, Lumpkin County, White County, and Habersham County.

Using the same spatial information and assumptions, we utilized the Brown & Caldwell tool to estimate the size of pipelines and associated minimum total project cost of each section of the pipeline system. The resulting sizes and costs of the system are shown in Figure 3.

The total project cost of the pipeline system is estimated to be **$1.32 billion but could be significantly higher on account of factors discussed in this memorandum**. In addition, the energy needed to pump water uphill and back to the water supply providers upstream of Buford Dam will certainly exceed the amount of energy generated through Buford Dam, and the energy cost associated with pumping the water back uphill likely exceeds the hydropower value of such water (i.e., the value derived from releasing the water through Buford Dam's turbines rather than allowing the water to be withdrawn from Lake Lanier).

Scenario 2

In this scenario, we assume the very unlikely scenario that the Corps does not grant any allocation of storage in Lake Lanier for direct lake withdrawals other than 20 mgd provided for under relocation contracts and the 1956 Gwinnett County legislation. The 2040 water supply deficit would thus be 277 mgd.

Sub-Scenario 2A

In this sub-scenario, the 277 mgd gap in demand projected for 2040 would be met by two generic non-federal water supply reservoirs upstream of Lake Lanier and a system of pipelines and pump stations to transmit the water from the reservoirs to the water utilities. Figure 4 shows such a reservoir-and-pipeline configuration.

In addition to the caveats mentioned above, we add that it is even less clear that suitable land upstream of Lake Lanier would be available for reservoirs that would be large enough to meet such a high demand, or that such reservoirs would successfully complete the 404 permitting process and be built. Making the assumption that such reservoirs could be built, however, and using the assumption that water supply reservoirs would be constructed with a unit safe yield (mgd) cost of $2.2 million to $6.2 million, we estimate that the cost of the reservoirs would be between **$609 million** and **$1.72 billion but could be significantly higher on account of factors discussed in this memorandum**.

Also using the same information and assumptions as we applied in analyzing Sub-Scenario 1A, and applying appropriate pipe sizes and corresponding total project cost of each section of the pipelines, we assumed the cost of the pipelines and pump stations that would be needed for delivery of water from the reservoirs. This information has been compiled and shown in Figure 4. The total project cost of the piping system would be approximately **$849 million but could be significantly higher on account of factors previously discussed in this memorandum**.

The total project cost of this reservoir-and-pipeline system is therefore estimated to be between **$1.46 billion** and **$2.57 billion but could be significantly higher on account of factors discussed in this memorandum**.

Sub-Scenario 2B

This sub-scenario is similar to 1B, with a much larger water supply deficit being met by a pipeline-only system. We continued to use the assumption that the starting point of the pipeline system would be at Morgan Falls. The other basic information, assumptions, and analytical tools applied to Sub-Scenario 1B also are applied here. Figure 5 shows the configuration. It has been assumed that the 20 mgd the Corps allocated from Lake Lanier storage applies to meet partial demands at the end of the eastern pipeline. Using these assumptions, the total project cost of the pipeline and pump station system is estimated to be approximately **$1.53 billion but could be significantly higher on account of factors discussed in this memorandum**.

Other Sources of Supply

We are not aware of other sources of replacement supply that are less costly or that would have less impact to the environment than those that we have presented here. Our estimates assume aggressive water conservation and, thus, further conservation is not anticipated to be an alternative to filling the demand gap. It is possible that some combination of the alternatives discussed above (e.g., new reservoirs and piping of water from the Chattahoochee River to the north) might be attempted, but we would anticipate the cost of that combination to be no less, and could be significantly greater, than the above alternatives.

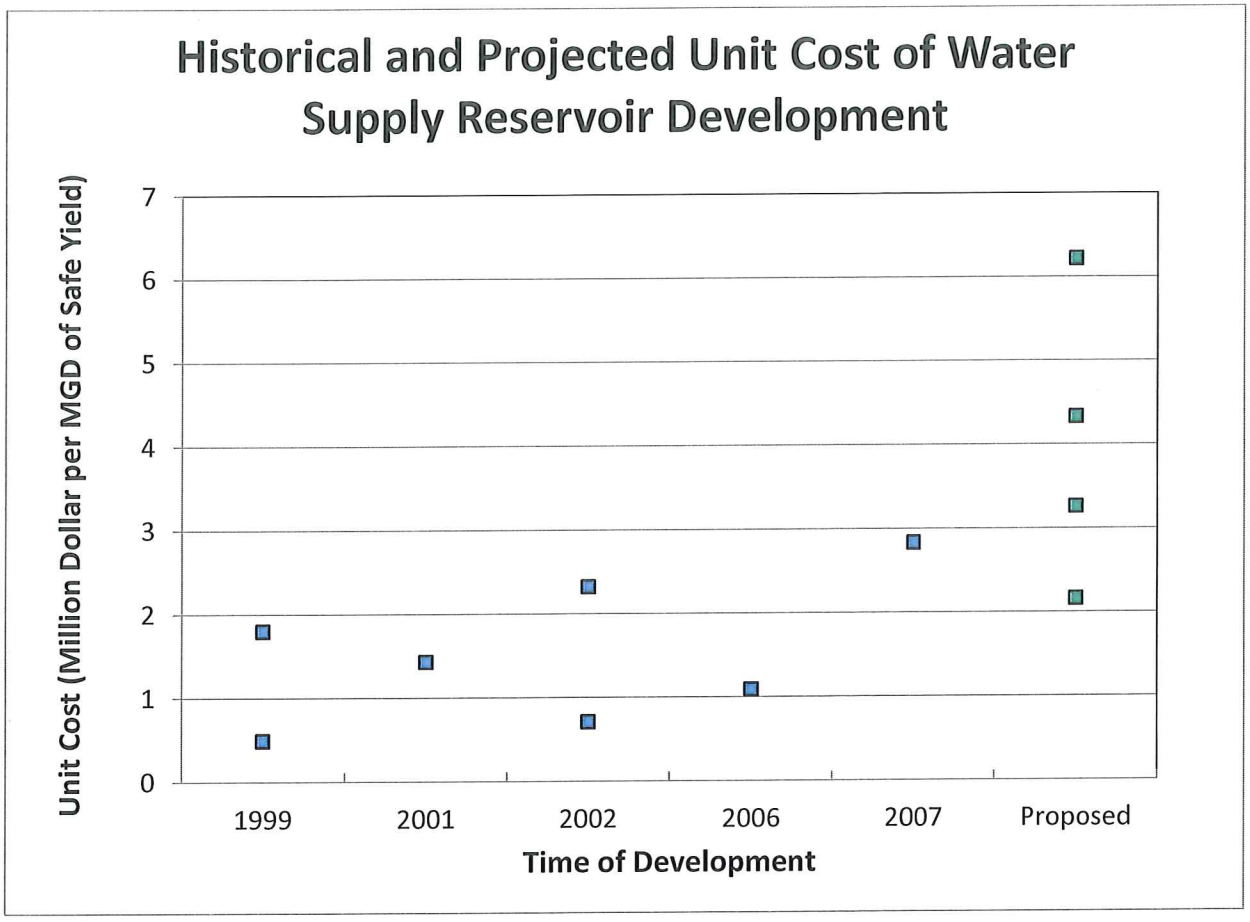


Figure 1. Historical and Projected Unit Cost of Developing Water Supply Reservoirs

Note: Blue squares – Costs of reservoirs that have been built

Green squares – Projected costs of reservoirs that are in planning stage

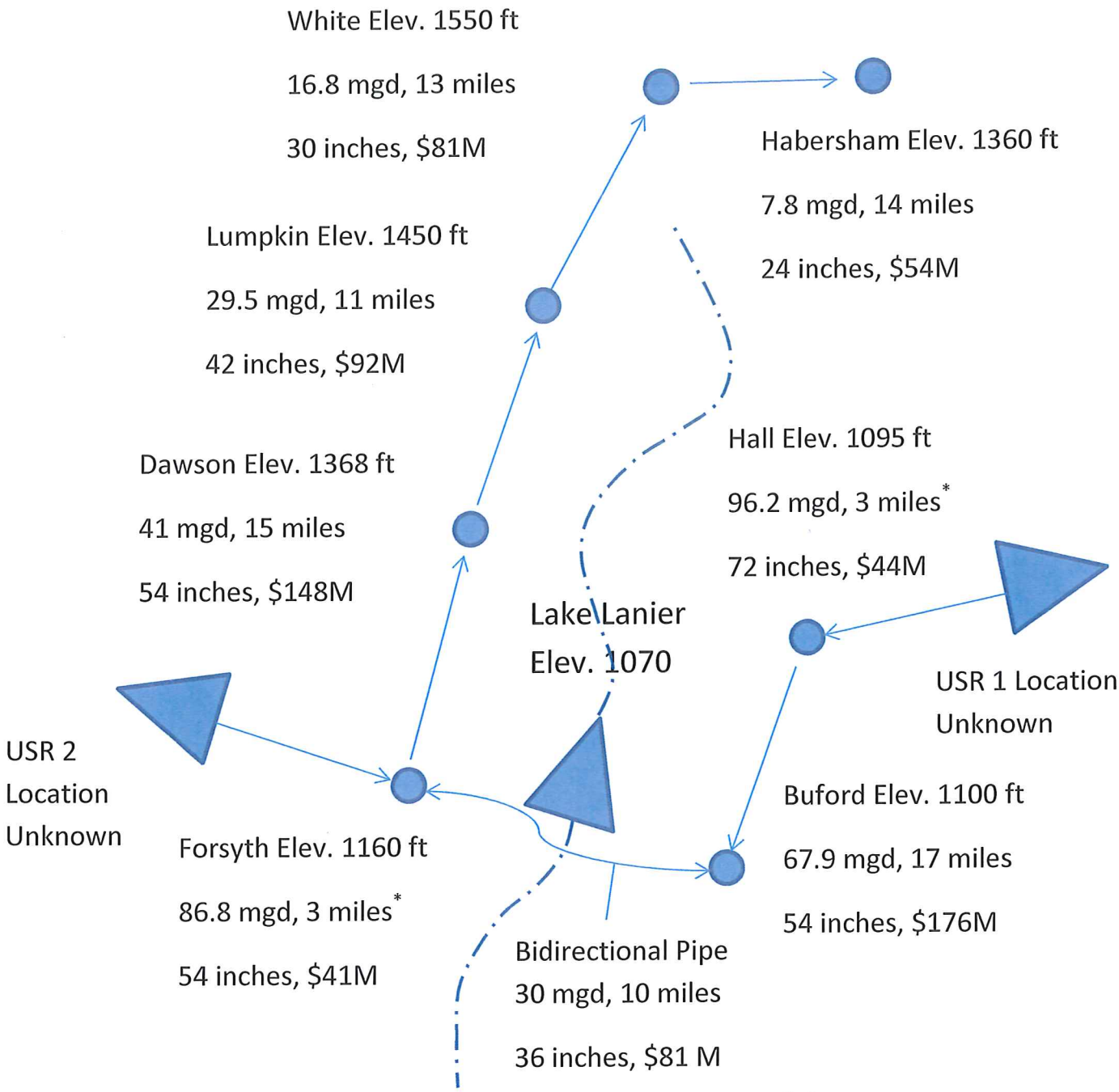


Figure 2. Sub-Scenario 1A Piping Configuration

Note:

* Locations of reservoirs unknown and distances from reservoirs to county population centers assumed

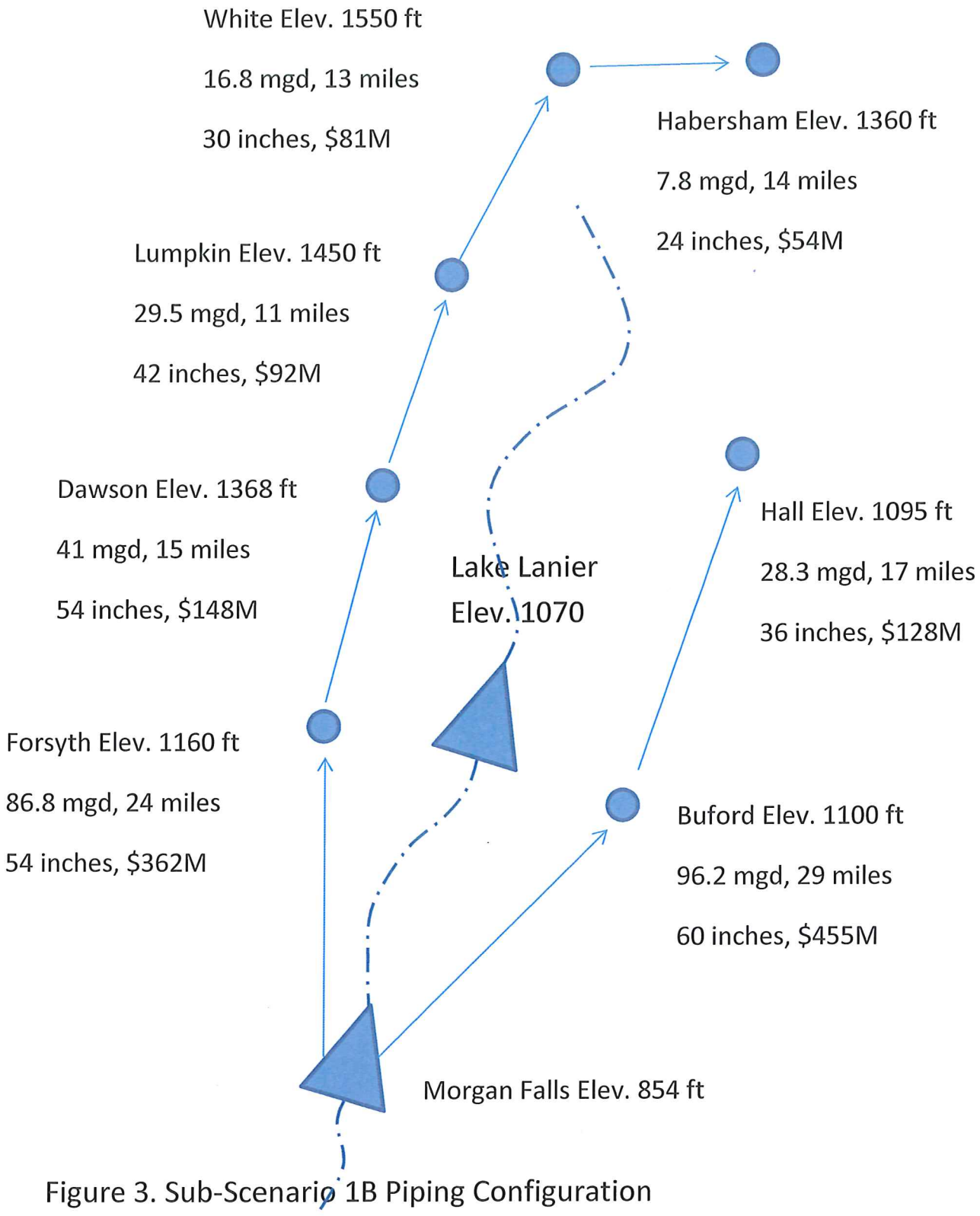
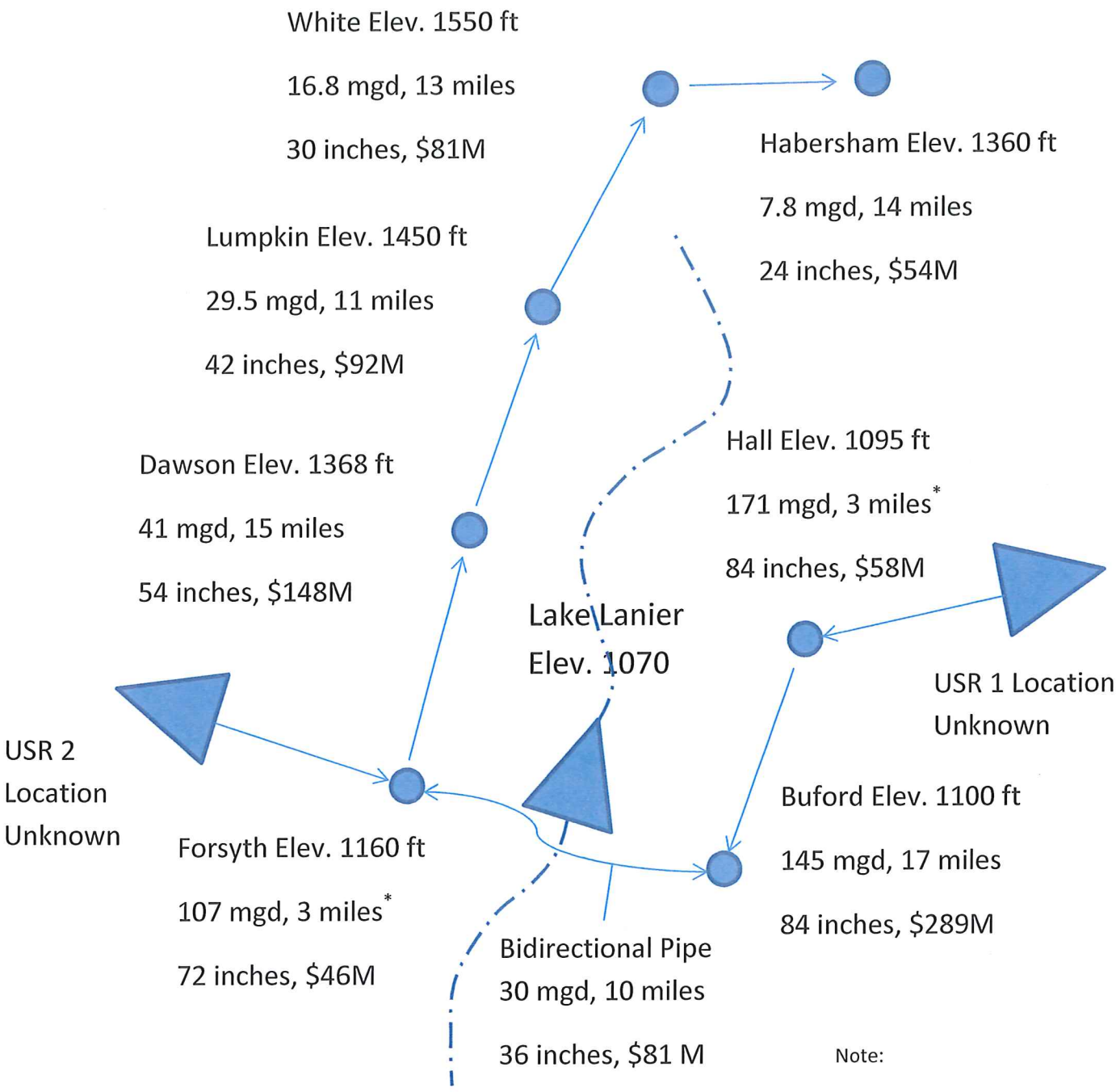


Figure 3. Sub-Scenario 1B Piping Configuration



Note:

* Locations of reservoirs unknown and distances from reservoirs to county population centers assumed

Figure 4. Sub-Scenario 2A Piping Configuration

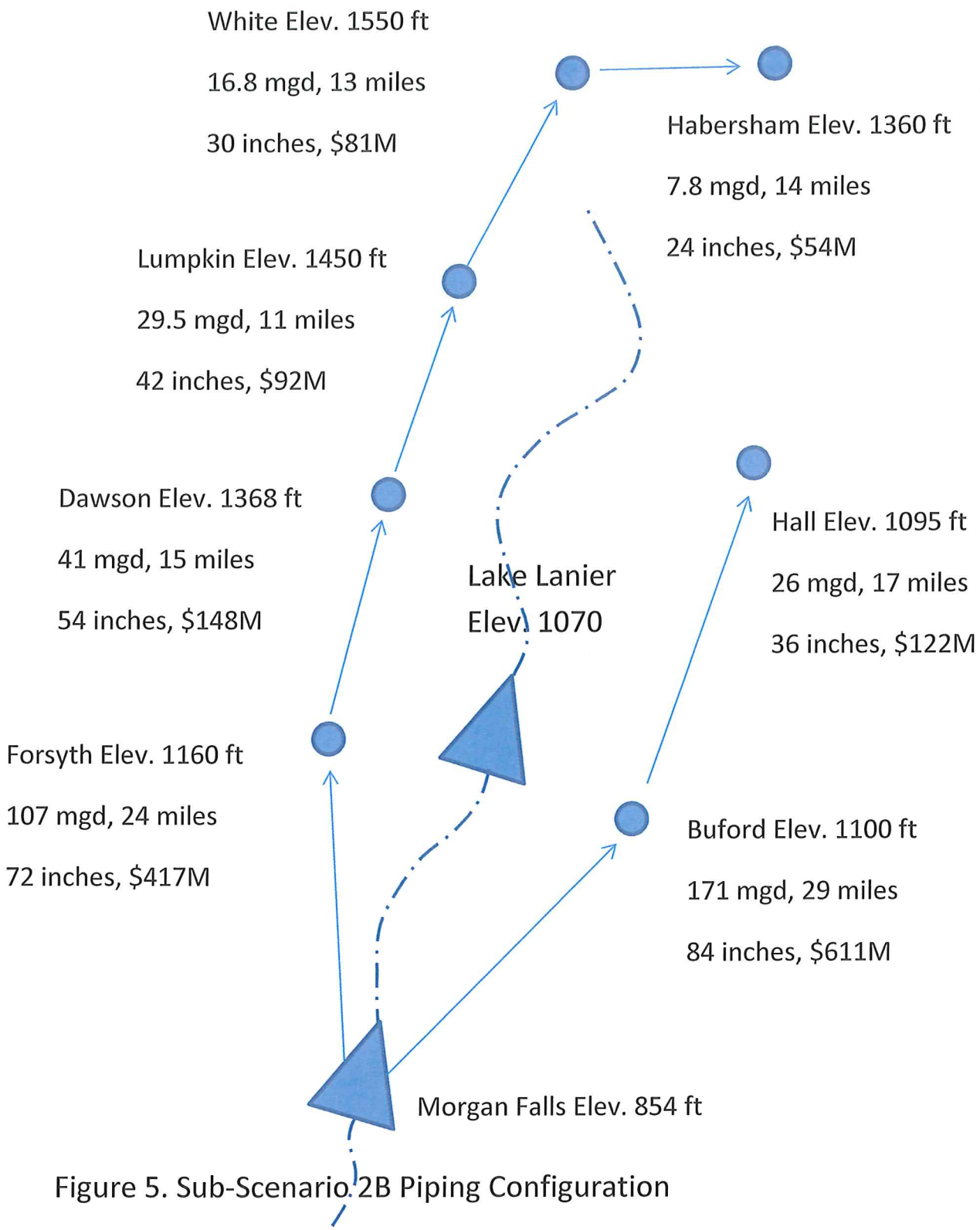


Figure 5. Sub-Scenario 2B Piping Configuration

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Appendix C: Water Supply Storage Assessment Costs Narrative

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Apalachicola-Chattahoochee-Flint Water Supply Storage Assessment
Cost Narrative

Rough Order Magnitude Cost Estimates

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Introduction

The purpose of this cost analysis was to provide independent cost estimates for water supply alternatives that could be implemented absent a reallocation from Lake Lanier. These estimates are used as a verification for costs provided by the State of Georgia regarding the two alternatives that were brought forward for the Most Likely/ Least Costly alternative analysis in the Water Supply Storage Assessment

Project Description

The most cost efficient and viable water supply measures to develop alternatives were considered for cost analysis, new reservoirs and Chattahoochee River Withdrawal and Pumping System. Expansion of reservoirs was also heavily considered as a viable option. Due to the lack of data from municipalities and our own (COE) for expansion of reservoirs through raising dam height and converting flood control to water supply, it was decided that expansion of reservoirs would only be explored if new reservoirs construction was justified economically. Some of the measures considered but excluded due to known costs or viability for further analysis are: groundwater and aquifer storage and recovery (ASR), conversion from septic system to sewer, desalination, interbasin transfer.

1. Chattahoochee River Withdrawal and Pumping System

Chattahoochee River Withdrawal and Pumping System entails a pipeline network and pumps to redirect treated wastewater from the natural water (Chattahoochee River) back upstream for drinking water purposes (just south of Lake Lanier). Water discharged from waste water treatment plants along the river is captured at three withdrawal locations and pumped to water treatment plants upstream of the discharge areas. The map found on page 41 of the "Water Contingency Planning Task Force Report – Appendix III" was used as a guide for approximate water reuse withdrawal points and accompanying pipeline location. Elevation profiles were generated along serendipitous pipeline routes (extrapolated from the figures provided in the above reports) to determine the location of the Pump stations needed to carry the water to the furthest points of the map. Analysis was complete to determine the size and pipe material needed to convey the large quantity of water. Exact location of the network or pumping stations are not determined nor were the quantity and complexity of valves, air release valves, surge tanks, pumping system requirements and intake structures technically evaluated at this stage of the process. The estimated scope of the Chattahoochee River Withdrawal and Pumping System network is 155 miles with pump stations along the network providing up to 277 mgd .

2. New Reservoir Construction

The new reservoir construction entails the storage (earthen dam), pipeline and pumping infrastructures. Water treatment facilities were excluded based on the assumption that they can or will be able to handle the additional requested capacity. Yield analysis and locations can not be identified at this stage of the water supply study due to lack of time and funding for further investigations or preliminary designs. Since a size or number of reservoirs is not given without a yield analysis, the information provided within is given based on cost/safe yield mgd. See Cost Methodology for more details.

Cost Methodology

There are two measures considered for new water supply, new reservoirs and Chattahoochee River Withdrawal and Pumping System of water. Many other measures (see project description for details) were considered, but eliminated due to the known higher costs and viability.

The methodology was very similar for both projects. A Class 5 (parametric) estimate is provided for economic screening. The Class 5 estimate is based on 0-2% project definition using parametric estimating and judgment. These estimates are not location specific; therefore a design, full scope, real estate or environmental conditions are unknown. The estimates identified the appropriate civil works Work Breakdown Structure that include 03 reservoirs, 13 pumping plant, 19 Utilities (Pipelines), 01 Lands and Damages, 30 Planning, Engineering & Design and 31 Construction Management.

Each project site is unique; therefore, without specific locations, costs are difficult to capture. A broad parametric estimate was developed for each measure using information/contracts gathered from actual built projects from municipalities or the COE.

1. Price Level

Every contract had different **price levels**. For conceptual purposes and comparisons for parametric estimating, all of the costs were brought to date using CWCCIS tables. These values are "hidden" in the safe yield column. In this case for a Class 5 estimate, without location specific data, **escalation** is the best form of determining current price level costs. CWCCIS accounts used are: (03) Reservoirs, (13) Pumping Plants , (19) Utilities, (30) PED, (31) Construction Management. The CWCCIS tables were not used for the (30) PED or (31) Construction Management Accounts. Instead a percentage was derived from actual costs provided by municipalities then the percentage was applied to the 2014 price level.

2. Planning, Engineering, Design

The actual costs provided from municipalities for Still Branch Reservoir, Towaligia Reservoir and Hickory Log Creek Reservoir ranged from 12-17%. A much lower percentage was used for the Reuse due to the high cost and level of complexity.

3. Lands and Damages- Real Estate

Real Estate has too many variables to accurately determine a value on conceptual designs. Some of the variables are dependent on zoning, land condition and land use. As part of cost engineering judgment and information provided from Mobile District Real Estate Division the land values have been escalated using data for the State of Georgia from Real Estate U.S. Census Bureau and Lincoln Institute of Land Policy. Instead of using inflation or in many cases deflation from the price level provided to 2014 price level, a more conservative approach was taken. Inflation was determined using the given price level (based on the year of actual land purchase) to the highest point from that given time. For example, Still Branch Reservoir land acquisition was in 1999. Therefore I pulled the value of land for Georgia in the first quarter for 1999. I then pulled the highest value of land from 1999 to 2014 to determine the maximum inflation since 1999. The value would have deflated if I used 2014 value compared to 1999

value; therefore the previously detailed conservative approach is taking into account the risks involved in real estate.

After consultation with SAM Real Estate Division, it was also assumed that for the potable reuse measure, 1/3 of the easements are within the existing right of way. Real estate costs include 22 acres at $45,000 per acre and 560 acres of easements at $22,500 for a total of approximately $9,400,000.

4. Risk Analysis-Contingency

Due to associated risks, the lack of design and use of parametric cost information, it was agreed between the COST MCX and SAD that a contingency amount of 30% can be used for the measures. However, a contingency of 100% was used for 01 Account: Lands and Damages due to the high fluctuations in costs and unaccounted relocations that may be unavoidable.

Chattahoochee River Withdrawal and Pumping System Details

Contracts for 36" and 60" pipelines and pump stations were gathered from COE and municipality history. A wide variety of conditions are within.

For the pump stations, Jacksonville and Savannah COE contracts as well as a parametric estimating website were compared. For the pipelines, actual contracts (or part of the contracts) provided by municipalities or COE, most of which are in the surrounding area, were compared and summarized below.

- Still Branch Contract #1 (provided by municipality)
- SAM Jackson County Water Authority Contract #1
- SAM Jackson County Water Authority Contract #2 (pipeline partially under river)
- Pax Newsletter
- SAM Redstone
- Level Creek Force Main
- North Gwinnett Transmission Main
- Lanier Reuse Lines (provided by
- Lanier Reuse Lines Contract #2
- Hickory Log Creek

Pumping station costs vary considerably, depending on such factors as location, architectural design, capacity, pumping head, distance between stations and many more. It is unreasonable to prelude to a design for all of the mentioned details for a planning class 5 estimate; therefore parametric estimating was executed form a wide variety of projects based, for the most part, on capacity. See Tables 1 and 2 for a summary of the data collected and analyses for the cost development of the 36" and 60" pipeline construction. The pumping station costs were based on capacity. The pumping station cost development within the reuse network is summarized in Table 3: Basis of Pumping Stations.

Table 1: Basis for 36" pipeline costs

Past Construction Contracts	quantity	unit of measure	construction cost*	$/in-ft	price level	2014 price level	unit costs
*Still Branch Contract #1partial (36")	43,780	lf	6,200,015		2005	8,053,391	183.95
Jackson County Water Authority (30")Contract 1	31,700	lf	5,574,034		2006	6,909,967	217.98
***Jackson County Water Authority (30")Contract 2	15,840	lf	4,424,283		2006	5,484,654	346.25
Pax Newsletter	1	lf	142		2013	144.698	144.70
Redstone	32,902	lf	32,902		2001	2,438,367	209.36
Level Creek Force Main (36")- Georgia	10,275	lf	2,222,228		2003	3,556,524	346.13
**North Gwinnett Transmission Main (30" & 48")	23,545	lf	8,043,581	8.17	2007	8,270,843	351.28

Average Parametric Unit Cost for 36" pipeline $257.09

NOTES:

** Adjusted for 36" through $/in-ft

* took out portions 24" transmission lines

***partially under a River

Redstone provided by Joe Ellsworth

Jackson County found on shared drive

Still Branch provided by Municipality

Level Creek and North Gwinnett provided by Dieter Franz (AE)

1

1

Table 2: Basis for 60" pipeline costs

Past Construction Contracts	quantity	unit of measure	construction cost*	price level	2014 price level	Diameter (in.)
Lanier Reuse Lines (Steel)	5,500	lf	3,151,259	2003	5,043,375	72
Lanier Reuse Lines (Steel)	720	lf	412,529	2003	660,224	48
Lanier Reuse Lines Contract #2	27,021	lf	24,432,354	2007	29,180,439	70
Pax Newsletter	1	lf	263	2013	268.2008	60
Hickory Log Creek	5,600	lf	2,750,000	2008	3,183,763	42

Average Diameter	65.84
$/in-ft	14.89
Average Parametric Unit Cost for 60" pipeline	**$893.17**

NOTES:

There is a lack of 60" pipeline contracts therefore a combination of 42-72" pipelines have been evaluated with a $/in-ft.

Lanier and Hickory Log are projects advertised by Municipalities and provided by Dieter Franz

2

Table 3: Basis for Pump Stations

based on capacity	capacity (mgd)	No. Pumps	Unit Costs/ (mgd)	price level	2014 price level Unit Costs($/mgd)
costwater.com	50	?	113,562	1999	179300
	100	?	87,064	1999	137463
*SAS Montgomery Pump Station	200	4	50000	1999	78944
319	2142	5	12,737	2000	20293
9A	269	4	21,991	2000	35035
362	2260	7	12,880	2000	20521
361	40	3	54,250	2001	86605
382	205	3	49,181	2003	79911
383	22	2	48,240	2003	78382
385	86	4	30,585	2004	50843
357	309	5	33,621	2005	59505
Picayune Strand - Merritt	554	6	82,298	2009	157251
Picayune Strand - Faka	1679	9	40,293	2010	76441
Picayune Strand - Miller	791	8	86,024	2013	170625

Average Parametric Unit Cost for Pump Stations w/ intake structures	**$**	**87,937**
Average Parametric Unit Cost for Pump Stations w/o intake structures	**$**	**70,350**

Notes:

* Savanah project provided by Bill Guidry.

projects 4-14 provided by Jacksonville

Intake Structures assumed to be 25% of pump station cost

1

2

The pipeline and pump station costs developed from recent contracts are used to determine an overall class 5 estimate from a rough order magnitude scope provided by SAM engineering design team. Table 4 contains the pipeline network costs and Table 5 contains the pumping stations costs.

Table 4: ROM Scope and Costs of Potable Reuse Pipeline Network

	Pipeline Location	Length (mi.)	No. Pipes	TOTAL Length (mi.)	TOTAL Length (LF)	
1	Cedar to Bellwood	21.25	5	106.25	561,000	
2	Bellwood to Dekalb	15.3	5	76.5	403,920	964,920
3	Dekalb to PS #1	18	4	72	380,160	
4	Dekalb to PS #2	4.3	4	17.2	90,816	
5	PS #1 to Forsyth	11.5	4	46	242,880	
6	PS #2 to Buford	13.5	4	54	285,120	
7	Buford to Hall	13.2	4	52.8	278,784	1,277,760
8	Lake Jackson to PS #3	24.8	2	49.6	261,888	
9	PS #3 to PS #4	19	2	38	200,640	
10	PS #4 to Buford	8.2	2	16.4	86,592	
11	Buford to Lanier WTP	4.8	2	9.6	50,688	599,808

Assume 60" transmission	1,564,728	LF	@	$1,397,561,645
Assume 36" transmission	1,277,760	LF	@	$328,504,406

Total Pipeline Estimated Construction Cost		$1,726,066,051
	rounded	**$1,726,000,000**

Table 5: ROM Scope and Costs of Reuse Pumping Stations

	Pipeline Location	hp	Capacity (mgd)	PS Cost/ Segment
1	Cedar to Bellwood	4409	205	18,027,088
2	Bellwood to Dekalb	3190	205	14,421,671
3	Dekalb to PS #1	1772	73	5,135,522
4	Dekalb to PS #2	1802	72	5,065,172
5	PS #1 to Forsyth	1274	73	5,135,522
6	PS #2 to Buford	1908	72	5,065,172
7	Buford to Hall	1120	72	5,065,172
8	Lake Jackson to PS #3	5574	77	6,771,150
9	PS #3 to PS #4	5941	77	5,416,920
10	PS #4 to Buford	3305	77	5,416,920
11	Buford to Lanier WTP	660	77	5,416,920

Total Pump Station Estimated Construction Cost	$ 80,937,230
	$ 81,000,000

New Reservoir Construction Details

Contracts and financial records were provided by cooperating municipalities from the northern Georgia region for Still Branch (2005), Towaligia(1999) and Hickory Log Reservoirs(2006). ***

Averages were determined based on a 2014 price level for each of the features except real estate. The highest cost was used to remain conservative and reduce some of the risks associated with real estate.

Yield Analysis is not verified by the USACE SAM engineering team. Costs are based on the assumption that the yield will be available for combined projects also without an analysis of the interaction between proposed measures. Site-specific studies to determine minimum flow would not be beneficial due to time and costs at this point of the water supply study.

No costs are included for water quality issues. It is also assumed that existing water treatment facilities can handle the additional flow or will be modified regardless of the outcome of this study to handle additional flow.

Table 6 summarizes the averages, but details of the above listed reservoirs are available upon request.

Table 6: 2014 Price Level New Reservoir Construction

Averages	28	safe yield (mgd)	Cost/mgd safe yield	
land acquisition		15,337,291.24	547,760.40	/MGD safe yield
reservoir (earthwork)		$ 36,537,541.39	1,304,912.19	
pumping stations		13,370,048.10	477,501.72	
pipeline		11,286,286.25	403,081.65	
environmental (wetland mitigation)		3,113,782.25	111,206.51	
PED		10,514,791.75	17%	363,430
Construction Management		2297271.213	4%	87,420
Construction Costs		69,432,296.47		**3,295,311.99**
TOTAL		**82,244,359.43**	**rounded**	**3,300,000.00**

Conclusion

The Chattahoochee River Withdrawal and Pumping System that can supply 277 mgd will cost approximately $2.57 billion. The reservoir construction costs are based on an average 28 mgd safe yield reservoir; therefore the total construction cost would be approximately $128 million. Since the costs are so highly variable for reservoir construction, it is better to express the costs per mgd safe yield. With that being said, one coud expect the new reservoir construction to be approximately $4.56 million per 1 mgd safe yield. Tables 7 and 8 summarize the Rough Order Magnitude (Class 5) estimates for both measures described.

If any option is deemed viable from the economic analysis, further details will be explored to provide an estimate supported by further investigations, preliminary designs, appropriate risk analysis, total project cost summary and MCACES estimate.

TABLE 7 - SUMMARY OFCHATTAHOOCHEE RIVER WITHDRAWAL AND PUMPING SYSTEM ROM COST (2014 PRICE LEVEL)

WBS No.	Description	UOM	Total
19.	PIPELINE NETWORK	LS	$1,726,000,000
	CONTINGENCY	30%	518,000,000
13.	PUMPING STATIONS	LS	$81,000,000
	CONTINGENCY	30%	24,000,000
01.	LANDS AND DAMAGES	LS	$9,400,000
	Land acquisition and ROW easements		
	CONTINGENCY	100%	9,400,000
30.	PLANNING, ENGINEERING AND DESIGN	LS	$90,000,000
	CONTINGENCY	30%	27,000,000
31.	CONSTRUCTION MANAGEMENT	LS	$63,000,000
	CONTINGENCY	30%	20,000,000
	TOTAL PROJECT COST FY-2014		$ 2,567,800,000

TABLE 8 - SUMMARY OF RESERVOIR ROM COST
(2014 PRICE LEVEL- BASED ON 1 MGD SAFE YIELD)

WBS No.	Description	UOM	Total
03.	RESERVOIRS	LS	$1,305,000
	CONTINGENCY	30%	391,000
13.	PUMPING PLANTS	LS	$881,000
	CONTINGENCY	30%	264,000
01.	LANDS AND DAMAGES	LS	$547,800
	Land acquisition and ROW easements		
	CONTINGENCY	100%	547,800
30.	PLANNING, ENGINEERING AND DESIGN	LS	$395,000
	CONTINGENCY	30%	119,000
31.	CONSTRUCTION MANAGEMENT	LS	$87,000
	CONTINGENCY	30%	26,000
TOTAL PROJECT COST FY-2014		$ 4,563,600/1 MGD SAFE YIELD	

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Appendix D: Hydropower Analysis Report

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ACF Hydropower Impact Analysis

Prepared by

The Hydropower Analysis Center

For

U.S Army Corps of Engineers

Mobile District

October 2016

ACF HYDROPOWER IMPACT ANALYSIS

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LIST OF ACRONYMS

ACF	Apalachicola-Chattahoochee-Flint
AEO	Annual Energy Outlook
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EMM	Electricity Market Model
FERC	Federal Energy Regulatory Commission
GPC	Georgia Power Company
MW	Megawatt
MWh	Mega-watt hours
NEMS	National Energy Modeling System
NERC	North American Electric Reliability Corporation
PMA	Power Marketing Agency
ResSim	Reservoir Simulation
SEPA	Southeastern Power Administration
SERC	SERC Reliability Corporation
SERC/S	SERC Reliability Corporation Sub-region
USACE	U.S. Army Corps of Engineers

ACF HYDROPOWER IMPACT ANALYSIS

INTRODUCTION

This chapter presents an analysis of the effects on hydropower benefits that are expected to result from proposed changes to system water control operations within the Apalachicola-Chattahoochee-Flint (ACF) River Basin. The system hydropower benefits for energy and capacity were computed for the no action alternative condition, representing current water control operations, and for nine alternative flow scenarios associated with the recommended ACF Water Control Plan described in previous chapters of this Environmental Impact Statement (EIS). The calculations of hydropower energy and capacity benefits are based on a 72-year simulation period (1940-2011) using the HEC-ResSim model.

To understand how system operations can effect hydropower generation we will first consider the mathematics used to approximate the amount of power produced from a hydropower facility, the power equation (Eq. 1). This equation shows that power is directly proportional to three variables; the efficiency of the plant turbines, the amount of flow going through the turbines, and the head, the height of the water in the reservoir relative to its height after discharge.

$$P = e * g * Q * H \qquad \text{Eq. 1}$$

Where P = power (kW), e = turbine efficiency, g = gravitational constant (m/s^2), Q-flow (m^3/s), and H = head (m).

Reservoir operations can affect all three of these variables. Higher or lower operational reservoir elevations change the head. Maximum or minimum flow requirements used for flood risk management and environmental purpose can affect the flow. Although power is linear in both head and flow, this relationship quickly becomes non-linear with the inclusion of efficiency which is both a non-linear function of head and flow.

In general the hydropower benefits resulting from generation can be divided into two components: energy benefits and capacity benefits. A change in energy benefits is the result of a change in the amount of water that is available to pass through the turbines. The value of this benefit changes both daily and seasonally as a function of the systems electrical load. For example energy may be more valuable during the height of the summer heat while businesses and residents are attempting to cool their environments as opposed to the fall or winter when air conditioners maybe turned off. The capacity benefit is a measure of the amount of capacity that the project can reliably contribute towards meeting system peak power demands.

The value of the hydropower benefits calculated in this chapter is based upon the cost of utilizing the most likely alternative source for power. For example, if an operational strategy reduces hydropower storage or flow, the loss in energy benefits is equivalent to the cost of replacing the lost power with the most likely alternative source of power. In addition it may decrease the amount of capacity that the hydropower plant can contribute to the peak system load, making it necessary to replace this lost capacity with a thermal alternative.

This chapter contains the following: 1) an overview of the bulk power system for the ACF River Basin with an emphasis on hydropower, 2) a descriptive analysis of the potential annual and seasonal changes in hydropower production due to water control management decisions, and 3) a description of the process of calculating the changes in the energy and capacity benefits of the ACF System resulting from the implementation of the recommended plan.

ACF BULK POWER SYSTEM DESCRIPTION

The ACF Watershed lies primarily in the southeastern sub-region of the SERC Reliability Corporation (SERC). This corporation is responsible for promoting and improving the reliability related to the critical infrastructure of the bulk power system in the region. Since 1998, the southeastern sub-region has undergone a significant increase in natural gas capacity. Natural gas surpassed coal in percentage of total system capacity in 2010 up to 41 percent of the total system in 2012. Nuclear and hydroelectric energy make up the remaining bulk energy with about 15 percent and 10 percent of total system capacity respectively and have remained relatively steady. (Figure 1)

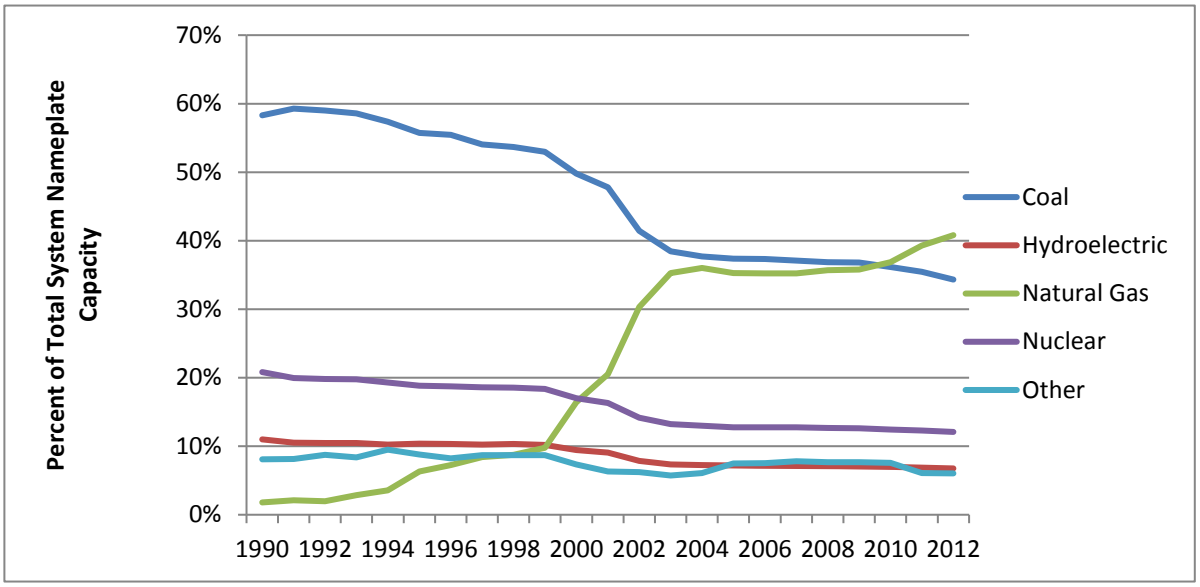

FIGURE 1. HISTORICAL TRENDS FOR THE PERCENT OF TOTAL SYSTEM CAPACITY FOR THE ALABAMA/GEORGIA REGION OF SERC

Coal and nuclear power are predominately run as baseload plants, facilities that produce constant rates of generation to meet the systems continuous regional demands. Natural gas and hydropower plants on the other hand are generally run as peaking plants, meeting the daily and seasonal peak loads throughout the system. This is important in conceptually understanding what alternative thermal plants might be used to replace hydropower if changes in operations dictated such a need. As an illustrative example consider the 2009 monthly generation pattern (Figure 2) reported by the Energy Information Administration (EIA) for the southeastern sub-region. Increases (decreases) in percent of total generation for hydropower are matched by decreases (increases) in percent generation for natural gas. The same coupling of energy sources can be seen in the relationship between coal and nuclear power.

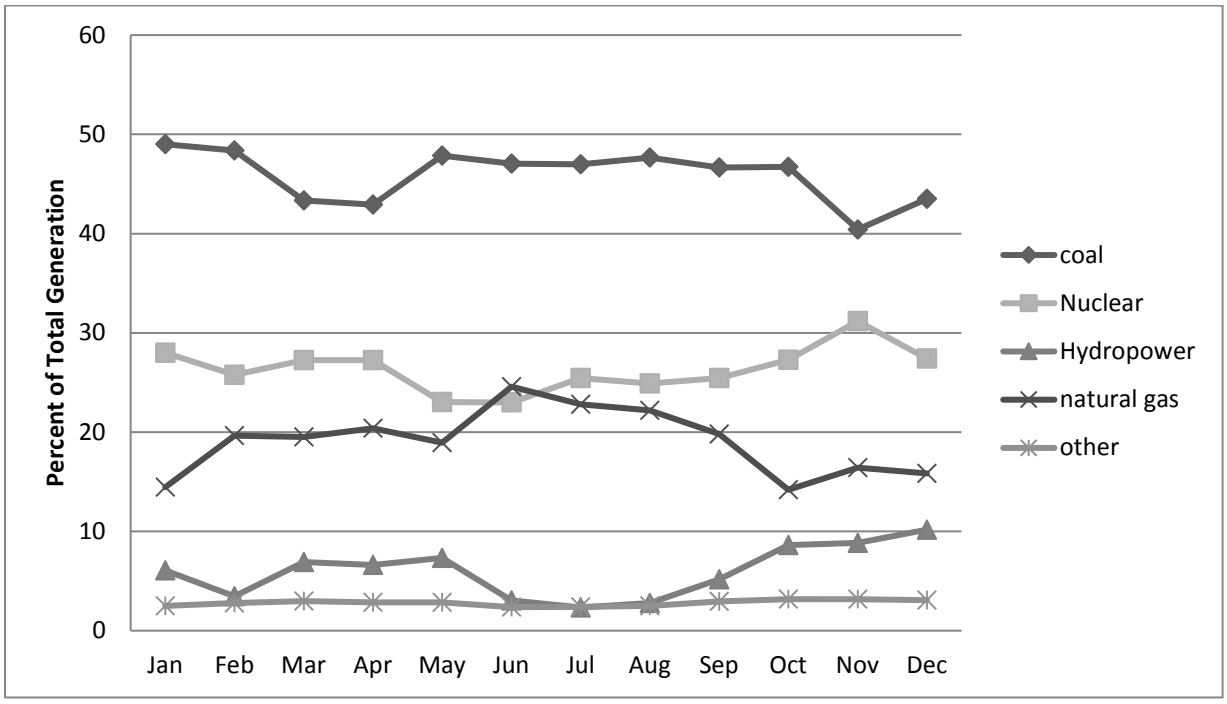

FIGURE 2. PERCENT OF TOTAL GENERATION BY FUEL TYPE FOR SOUTHEASTERN SUB-REGION OF SERC

ACF HYDROPOWER SYSTEM DESCRIPTION

The U.S. Army Corps of Engineers (USACE) operates four dams with hydropower capabilities in the ACF River Basin: Buford Dam, West Point Dam, Walter F. George Lock and Dam, and Jim Woodruff Lock and Dam. Buford Dam, West Point Dam and Walter F. George Lock and Dam are operated as peaking plants with an installed capacity of 381 megawatts (MW) while Jim Woodruff Lock and Dam, located near the confluence of the Chattahoochee and Flint Rivers, is operated as a run-of-river plant with an installed capacity of 43.3 MW. Buford and West Point Dams both have small units, generally used for system station service, that are excluded from the plant's combined nameplate capacity and Reservoir Simulation model (ResSim) simulation.

Five non-USACE plants owned by Georgia Power Company (GPC) are also considered in this analysis. Morgan Falls, Barlett's Ferry, Goat Rock, Oliver, and North Highlands (listed in downstream order) all act as modified run-of-river plants. The GPC plants utilize small amounts of storage to help re-regulate the variable releases of the upstream USACE reservoirs. These plants have a combined installed capacity of 342.9 MW.

Table 1 provides specific plant level details. In this table an individual plant is described by three different capacity terms, each playing a different role in the analysis. The nameplate capacity describes the actual amount of capacity installed for the plant according to the turbine manufacturers and does not account for limits imposed by other power train equipment. The maximum or operating capacity describes the maximum capacity at which a plant can operate based on the turbines running at full gate, the adjustment of the turbine to utilize maximum capacity instead of maximum efficiency. This value varies slightly depending on factors such as head and cooling capabilities. This is the capacity assumed in the ResSim model. Finally, the marketable capacity is meant to describe the amount of capacity available during the heavy load periods of summer months during extreme hydrological conditions such as a drought. For the Federal plants, the marketable capacity was confirmed by Southeastern Power Administration (SEPA), while for the GPC plants nameplate capacity (reference http://www.georgiapower.com) was assumed for both operating and marketable capacity.

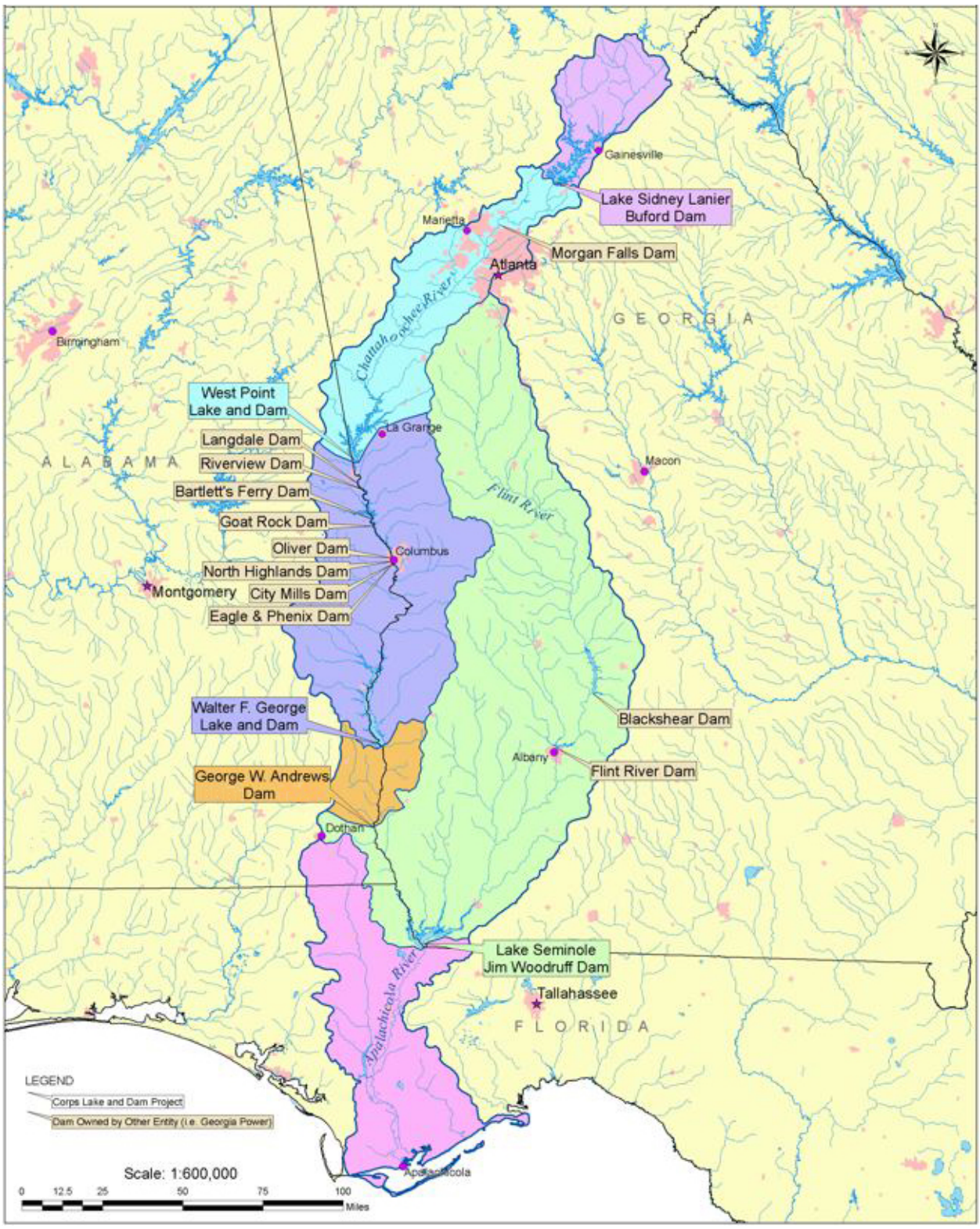

FIGURE 3. MAP OF HYDROPOWER FACILITIES IN THE ACF BASIN

TABLE 1. PLANT CHARACTERISTICS FOR USACE AND NON-USACE HYDROPOWER PLANTS

Plant	Owner	No. of Units	(Installed) Capacity (MW)	Operating Capacity (MW)	Marketable Capacity (MW)
Buford Dam	USACE	3	125	116.5	105
Morgan Falls	GPC	7	16.8	16.8	16.8
West Point Dam	USACE	3	88	85.5	75
Bartletts Ferry	GPC	6	197.9	198.6	197.9
Goat Rock Dam	GPC	6	26	40.04	26
Oliver Dam	GPC	4	60	60	60
North Highlands	GPC	4	29.6	35.2	29.6
Walter F. George	USACE	4	168	167.6	150
Jim Woodruff L&D	USACE	3	43.3	43.2	36

AVERAGE ANNUAL HYDROPOWER GENERATION

To determine the change in energy generation resulting from implementation of the recommended ACF Water Control Plan, an analysis was performed to determine the average annual energy generated for the 10 alternatives. Please refer to section 5.2 in Vol 1 of FEIS for reference to alternative descriptions. The Alt7-OptionJ has the most average annual generation with almost 2.1 million mega-watt hours (MWh) of generation. The Alt7-OptionK alternative has the least with only around 2.03 million MWh of annual generation. (Figure 4) However, the value of the replacement energy has a seasonal trend following the demand and generating resource availability through the year. Therefore, in calculating annual benefits, it is necessary to look at how the generated energy is distributed on a monthly basis. This is method is discussed in the next section.

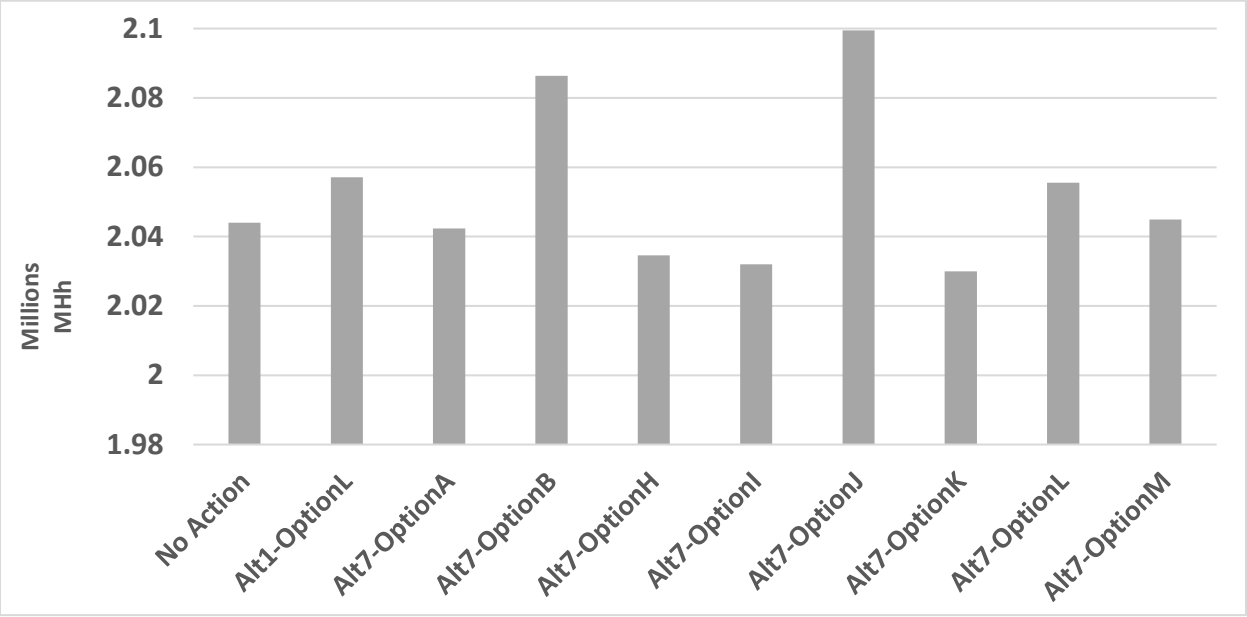

FIGURE 4. AVERAGE ANNUAL HYDROPOWER SYSTEM GENERATION BY ALTERNATIVE

Figure 5 shows both the percent difference between the No Action alternative and the remaining nine alternatives broken down by plant. Both ALT7-OptionB and Alt7-OptionJ showed a moderate percent increase in annual generation when compared to the No action alternative for almost all plants. Alt1-OptionL and Alt7-OptionL also showed a small increase for most plants. The remaining alternatives show a mix of loss and small gains for plants within each alternative, with Alt7-OptionH, Alt7-OptionI, and Alt7-OptionK showing a loss across all plants.

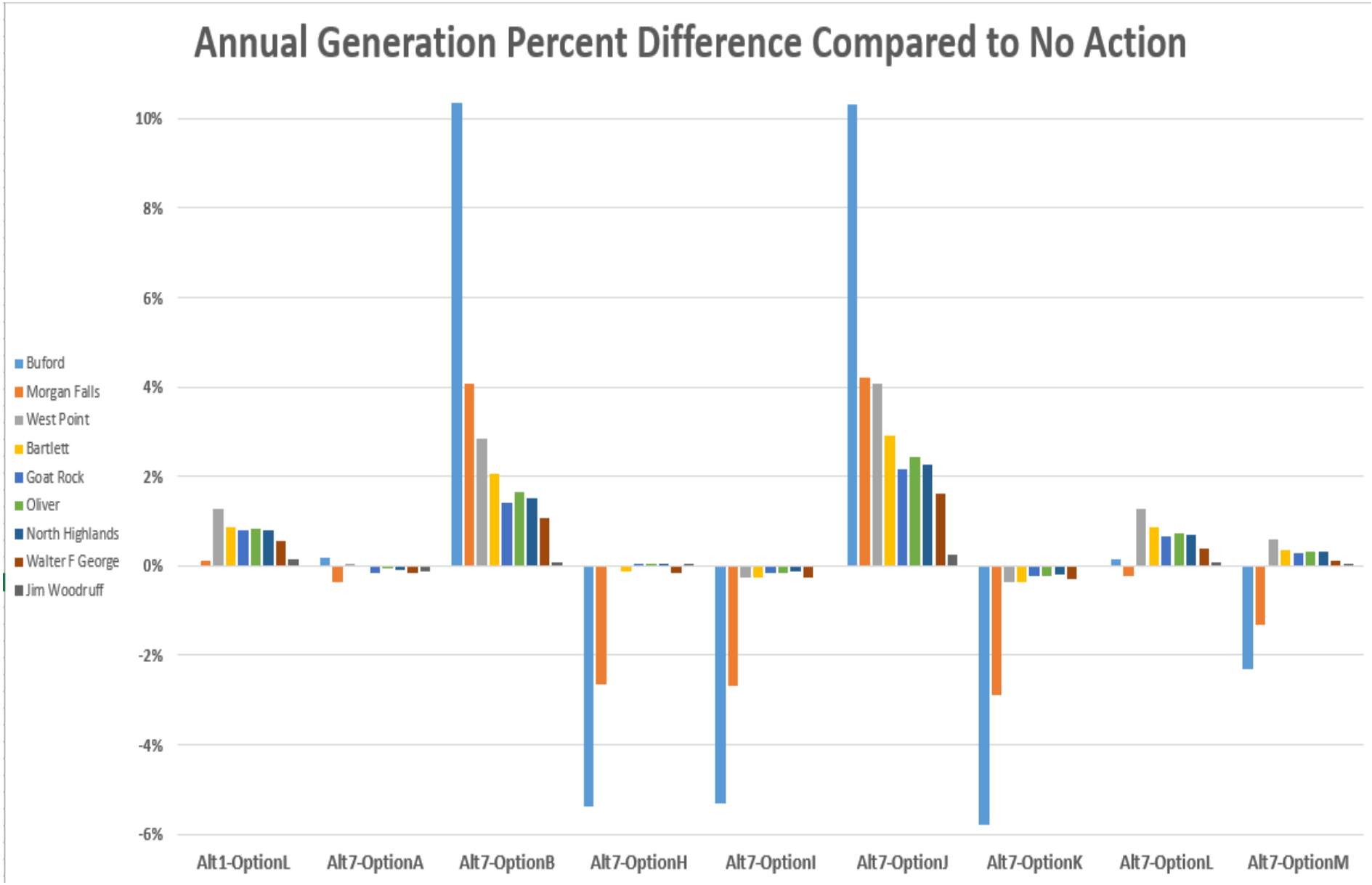

FIGURE 5. ANNUAL GENERATION PERCENT DIFFERENCE COMPARED TO NO ACTION ALTERNATIVE BROKEN DOWN BY PLANT

ENERGY BENEFITS

Energy benefits are computed as the product of the energy loss in megawatt-hours and an energy unit value price ($/MWh). The energy price is based on the cost of energy from a combination of thermal generating plants that would replace the lost energy from the hydropower plant due to operational and/or structural changes.

Energy Price Computation

This analysis uses a simulation over the period of record to estimate the effects of changes in water management on hydropower production. However, in order to evaluate the resulting changes in hydropower benefits over a 50-year period of analysis, forecasts of future energy prices are needed. These forecasted prices also need to reflect seasonal variation of both peak and off peak prices.

Energy Price Data Used

To estimate regional future energy prices that reflect both seasonal and peak and off-peak variation two sources of data are required. The first data source is the EIA long-term energy forecast, while the second data source is the system λ values reported in the Federal Energy Regulatory Commission (FERC) Form 714 reports.

Energy Information Administration (EIA) Historical and Long-Term Forecast

Future and historical energy values in this analysis are based on EIA forecasts from the supplemental tables of "Annual Energy Outlook" (AEO 2013). The EIA forecasts are developed with the Electricity Market Model (EMM) as part of the National Energy Modeling System (NEMS). The following description is from the model documentation report available on the EIA website:

> *The National Energy Modeling System (NEMS) was developed to provide 20- to 25-year forecasts and analyses of energy-related activities. The NEMS uses a central database to store and pass inputs and outputs between the various components. The NEMS Electricity Market Module (EMM) provides a major link in the NEMS framework (Figure 1). In each model year, the EMM receives electricity demand from the NEMS demand modules, fuel prices from the NEMS fuel supply modules, expectations from the NEMS system module, and macroeconomic parameters from the NEMS macroeconomic module. The EMM estimates the actions taken by electricity producers (electric utilities and nonutilities) to meet demand in the most economical manner. The EMM then outputs electricity prices to the demand modules, fuel consumption to the fuel supply modules, emissions to the integrating module, and capital requirements to the macroeconomic module. The model iterates until a solution is reached for each forecast year.*

In addition to providing average annual energy forecasts of electrical generation prices through 2040, AEO 2016 also includes regional forecasts corresponding to North American Electric Reliability Corporation (NERC) regional entity sub-regions. Federal ACF hydropower plants are located in the southeastern sub-region of SERC Reliability Corporation (SERC/S). Discussions with SEPA confirmed that most of the electrical generation from ACF plants is marketed through SERC/S, and that EIA forecasts of thermal generation prices for the SERC/S region was appropriate for this analysis.

System Lambda

Because EIA provides only a single average energy value for each future year through 2040, the EIA forecasts values are used to shape system λ values acquired from the Federal Energy Regulatory Commission (FERC) Form 714 reports. For utilities generating electricity from thermal plants, Form 714 requires reporting of hourly energy demand (load) and the hourly marginal cost (lambda) of generating one additional MW of electrical energy.

The following explanation of how lambda was calculated is from the FERC Form 714 report, Part II, Schedule 6, filed for 2010 by Southern Company:

> *The Southern Company system lambda is determined hourly and is based on the variable costs of the resources that serve the load obligations of the Operating Companies plus any sales to third parties. The variable costs of the resources include the components listed below, and may also reflect the cost of purchases. The economic dispatch formula used to dispatch Southern's generating resources on the basis of their variable cost components is as follows:*
>
> $$\lambda = [\{(2aP + b) * (FC + EC)\} + VOM + FH] * TPF$$
>
> *Where:*
>
> λ = *System lambda*
>
> *a, b* = *Incremental heat rate coefficients*
>
> *P* = *Generation level*
>
> *FC* = *Marginal replacement fuel costs*
>
> *EC* = *Marginal replacement emission allowance costs*
>
> *VOM* = *Variable operations and maintenance expenses*
>
> *FH* = *In-plant fuel handling expenses*
>
> *TPF* = *Incremental transmission losses (penalty factors)*

Form 714 reports are available online for the five Southern Company utilities that generate thermal power in SERC/S for the years 2008 through 2015: Alabama Power, Georgia Power, Gulf Power, Mississippi Power, and Southern Power. Although newer reports are available, because of the need for consistency between the reports, the 2010 report continues to be used for this analysis. The five Southern Company utilities represent about three quarters of the fossil fuel generating capacity in the SERC/S sub-region and about 92 percent of the fossil generation for which system lambda is reported to FERC. While system lambda and load were also reported during this period by Southern Mississippi Electric Power Cooperative and Alabama Electric Cooperative, formatted data from these companies was not available for the entire period and therefore was not included in the calculations described below.

Methodology for Energy Price Shaping

To forecast the system λ using the EIA forecasted generation values the following ratio is assumed:

$$\frac{\lambda_{Future}}{\lambda_{Past}} = \frac{EIA\_Generation_{Future}}{EIA\_Generation_{Past}}$$

This can be rewritten as:

$$\lambda_{Future} = EIA\_Generation_{Future} * \frac{\lambda_{Past}}{EIA\_Generation_{Past}}$$

Future system λ values can then be computed by the product of the EIA generation forecast and a shaping ratio defined as:

$$ShapingRatio = \frac{\lambda_{Past}}{EIA\_Generation_{Past}}$$

To replicate the peak and off peak variation, daily system λ values are sorted from high to low and are averaged using the peak and off peak periods described in the Energy Benefits Calculation section below. Seasonal variability is taken into account by computing shaping ratios for each month. These shaping ratios are computed as averages among dates with like month and peak and off-peak classification using the equation:

$$\text{ShapingRatio}(\text{Peak/offpeak designation}, \text{month}) = \text{Average}\left(\frac{\lambda_{\text{Past}}(\text{Peak/offpeak designation}, \text{month})}{\text{EIA\_Generation}_{\text{Past}}(\text{year})}\right)$$

TABLE 3. PEAK AND OFF-PEAK SHAPING FACTORS FOR SERC/S SUB-REGION USING SOUTHERN COMPANY SYSTEM Λ VALUES

	Peak	Off-Peak
Jan	0.92	0.60
Feb	0.79	0.58
Mar	0.74	0.56
Apr	0.75	0.53
May	0.76	0.54
Jun	0.98	0.64
Jul	1.00	0.67
Aug	0.87	0.61
Sep	0.76	0.56
Oct	0.72	0.55
Nov	0.68	0.52
Dec	0.70	0.54

The proportions in Table 3 were then multiplied by the EIA forecast energy value for each year to obtain estimates of monthly on-peak and off-peak values. To develop the annualized prices for each calendar month, the present values of on-peak and off-peak prices for each month of the 50-year period of analysis were calculated using the Federal discount rate of four percent. The resulting 50 present values were then summed and amortized over the 50-year period of analysis at the Federal discount rate. The resulting annualized prices are shown in Table 4.

TABLE 4. AVERAGE ANNUAL ON-PEAK AND OFF-PEAK ENERGY PRICES BY MONTH (2016$)

	Peak	Off-Peak
January	$61.46	$40.08
February	$52.77	$38.74
March	$49.43	$37.41
April	$50.10	$35.40
May	$50.77	$36.07
June	$65.46	$42.75
July	$66.80	$44.76
August	$58.12	$40.75
September	$50.77	$37.41
October	$48.10	$36.74
November	$45.42	$34.74
December	$46.76	$36.07

It is important to note that there is a lot of uncertainty and volatility in energy market pricing and forecasted energy prices. As an example of this variation, Figure 6 shows the change in annualized energy value between 2010 and 2016. The prices used for this version of the report are the 2016 prices, but past versions of this report have used these other year's prices, depending on when the report was produced. Based on this snapshot, the year-to-year annualized energy price can vary as much as 7.6 percent and averages about 4.8 percent difference in these years. The percent difference in year-to-year annualized energy prices from 2010 to 2016 is shown in Table 5.

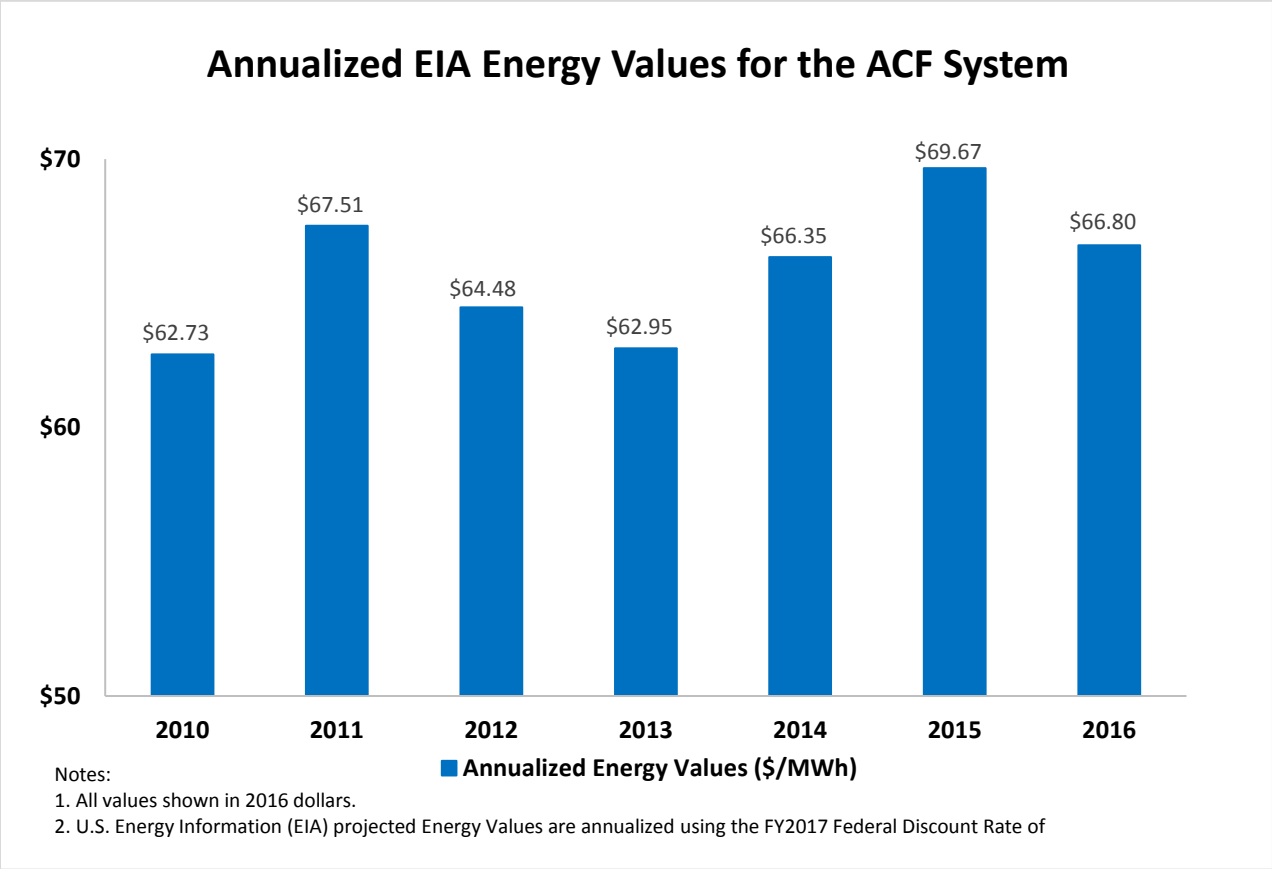

FIGURE 6. ANNUALIZED EIA ENERGY VALUES VS. ACF SYSTEM ENERGY BENEFITS (2016$)

TABLE 5. AVERAGE ANNUAL ENERGY VALUES PERCENT CHANGE 2010 - 2016

Annual Energy Values Percent Change	
2010	0.0%
2011	7.6%
2012	-4.5%
2013	-2.4%
2014	5.4%
2015	5.0%
2016	-4.1%

Energy Benefit Calculations

Although all plants in this system are defined as peaking plants the actual hydropower operations of the individual power plants can vary significantly. For example some plants may turn completely off and then back on again during peak demand periods, while others may have a minimum flow requirement that constantly generates a small amount of electricity with a maximum generation occurring during peak demand periods. Unfortunately, the detailed hourly generation information required from each plant to determine the daily peak and off peak percentage of total generation is not available. To calculate the energy benefits, the method assumes that plants will operate to maximize energy benefits; that is, to generate the maximum amount of energy during periods of peak demand.

The Southeastern Power Administration (SEPA) confirmed the seasonal variation of peak hours for the region. Eleven daily peaking hours were defined for the winter period from October 1 through March 31: 5:00 a.m. to 9:00 a.m. and 3:00 p.m. to 10:00 p.m., Monday through Friday. Six daily peaking hours were defined for the summer period from April 1 through September 30: 1:00 p.m. to 7:00 p.m., Monday through Friday. The maximum daily amount of peak generation for each plant was then defined as the product of the number of daily peaking hours times the installed capacity of the plant.

Table 6 shows each plants average annual energy benefits under the 10 alternative flow scenarios for the Federal plants. Table 7 shows the average annual energy value of the non-Federal plants. Table 8 shows the aggregate for all Federal and non-Federal plants.

TABLE 6. INDIVIDUAL PLANT AND TOTAL SYSTEM ENERGY BENEFITS FOR FEDERAL PLANTS (2016$)

	Buford	West Point	Walter F George	Jim Woodruff	Total Federal Energy Value
No Action	$6,249,655	$8,401,350	$21,906,299	$10,998,460	$47,555,765
Alt1-OptionL	$6,237,253	$8,501,730	$22,016,947	$11,013,238	$47,769,168
Alt7-OptionA	$6,235,148	$8,389,401	$21,871,504	$10,980,148	$47,476,200
Alt7-OptionB	$6,838,378	$8,602,616	$22,102,969	$10,996,858	$48,540,822
Alt7-OptionH	$5,895,821	$8,397,253	$21,880,835	$10,996,236	$47,170,145
Alt7-OptionI	$5,901,995	$8,375,963	$21,856,884	$10,990,634	$47,125,475
Alt7-OptionJ	$6,833,172	$8,702,600	$22,217,627	$11,012,505	$48,765,904
Alt7-OptionK	$5,873,796	$8,366,414	$21,846,725	$10,990,583	$47,077,518
Alt7-OptionL	$6,229,002	$8,490,763	$21,983,290	$11,000,033	$47,703,087
Alt7-OptionM	$6,081,520	$8,438,877	$21,927,026	$10,995,719	$47,443,141

TABLE 7. INDIVIDUAL PLANT AND TOTAL SYSTEM ENERGY BENEFITS FOR NON-FEDERAL PLANTS (2016$)

	Morgan Falls	Bartlett	Goat Rock	Oliver	North Highlands	Total Non-Federal Energy Value
No Action	$2,898,542	$19,183,268	$8,566,739	$10,743,894	$6,022,906	$47,415,349
Alt1-OptionL	$2,904,318	$19,337,909	$8,626,421	$10,821,033	$6,064,772	$47,754,452
Alt7-OptionA	$2,882,465	$19,162,476	$8,540,103	$10,716,874	$6,006,383	$47,308,301
Alt7-OptionB	$2,996,394	$19,524,311	$8,654,700	$10,874,519	$6,087,828	$48,137,752
Alt7-OptionH	$2,828,286	$19,159,988	$8,557,933	$10,729,693	$6,016,655.74	$47,292,556
Alt7-OptionI	$2,826,139	$19,130,175	$8,542,595	$10,712,278	$6,006,910	$47,218,097
Alt7-OptionJ	$3,003,097	$19,681,330	$8,715,039	$10,952,497	$6,130,289	$48,482,253
Alt7-OptionK	$2,820,918	$19,114,527	$8,538,120	$10,704,914	$6,003,413	$47,181,893
Alt7-OptionL	$2,890,201	$19,322,316	$8,603,429	$10,795,471	$6,049,862	$47,661,279
Alt7-OptionM	$2,861,605	$19,236,390	$8,576,061	$10,757,526	$6,030,354	$47,461,937

TABLE 8. TOTAL SYSTEM ENERGY BENEFITS (FEDERAL AND NON-FEDERAL PLANTS) (2016$)

	Federal Energy Value	Non-Federal Energy Value	Total
No Action	$47,555,765	$47,415,349	$94,971,114
Alt1-OptionL	$47,769,168	$47,754,452	$95,523,621
Alt7-OptionA	$47,476,200	$47,308,301	$94,784,501
Alt7-OptionB	$48,540,822	$48,137,752	$96,678,574
Alt7-OptionH	$47,170,145	$47,292,556	$94,462,701
Alt7-OptionI	$47,125,475	$47,218,097	$94,343,573
Alt7-OptionJ	$48,765,904	$48,482,253	$97,248,157
Alt7-OptionK	$47,077,518	$47,181,893	$94,259,411
Alt7-OptionL	$47,703,087	$47,661,279	$95,364,366
Alt7-OptionM	$47,443,141	$47,461,937	$94,905,078

Capacity Benefits

Capacity benefits are defined as the product of the change in dependable capacity and a capacity unit value, which represents the capital cost of constructing replacement thermal capacity.

The dependable capacity of a hydropower project is a measure of the amount of capacity that the project can reliably contribute towards meeting system peak power demands. If a hydropower project always maintains approximately the same head, and there is always an adequate supply of stream flow so that there is enough generation for the full capacity to be usable in the system load, the full installed generator capacity can be considered dependable. In some cases even the overload capacity is dependable.

At storage projects, normal reservoir drawdown can result in a reduction of capacity due to a loss in head. At other times, diminished stream flows during low flow periods may result in insufficient generation to support the available capacity in the load. Dependable capacity accounts for these factors by giving a measure of the amount of capacity that can be provided with some degree of reliability during peak demand periods.

Dependable Capacity Calculation Procedure

Dependable capacity can be computed in several ways. The method that is most appropriate for evaluating the dependable capacity of a hydropower plant in a predominantly thermal-based power system, like the ACF River Basin, is the average availability method. This method is described in Section 6-7g of EM 1110-2-1701, Hydropower, dated 31 December 1985. The occasional unavailability of a portion of a hydropower project's generating capacity due to hydrologic variations should be treated

in the same manner as the occasional unavailability of all or part of a thermal plant's generating capacity due to forced outages.

In order to evaluate the average dependable capacity for a project, a long-term record of project operation must be used. Actual project operating records would be most desirable; however, certain factors may preclude the use of these records. The period of operation may not be long enough to give a statistically reliable value. Furthermore, operating changes may have occurred over the life of the project, which would make actual data somewhat inconsistent. In order to assure the greatest possible consistency in this calculation, the 72-year ResSim simulation for the ACF River Basin was used.

The dependable capacity calculation procedure for the ACF River Basin projects began by approximating each project's contribution (weekly hours operating on peak) in meeting the system capacity requirements demand for the regional critical year. This contribution estimate was determined by first calculating each project's weekly average energy produced (MWh) for the peak demand months of mid-May through mid-September of 1981, the critical year from the ResSim baseline model run. This number was then divided by SEPA's defined marketable capacity (MW). This gave an estimate of weekly hours on peak for each project. Coordination with SEPA confirmed marketable capacity values for the USACE hydropower plants and the critical water year of 1981. Installed capacity was assumed for all non-USACE plants

Next, each project's weekly average energy (MWh) produced during the peak demand months was calculated for each simulated year. Dividing these values by each project's weekly average hours (H) on peak determined in the previous step, yielded an array of yearly dependable capacity values. The average across the array is each project's average dependable capacity.

This process is repeated for the two alternative scenarios using the ResSim model runs. The total system difference between the scenarios is the gain or loss in dependable capacity caused by changes in system water control operations. The results for capacity for the Federal plants, non-Federal plants, and the aggregate, using the No Action alternative as the comparison are shown in Tables 9, 10, and 11.

TABLE 9. PLANT AND SYSTEM DEPENDABLE CAPACITY CALCULATIONS FOR FEDERAL PLANTS WITH NO ACTION ALTERNATIVE

Capacity (MW)	Buford	West Point	Walter F George	Jim Woodruff	Federal Dependable Capacity Total
No Action	110.25	82.30	162.14	39.41	394.09
Alt1-OptionL	110.58	82.54	162.25	39.41	394.79
Alt7-OptionA	108.32	82.43	162.57	39.39	392.71
Alt7-OptionB	109.64	82.56	162.46	39.37	394.03
Alt7-OptionH	107.73	82.72	162.66	39.41	392.53
Alt7-OptionI	107.49	82.59	162.62	39.41	392.11
Alt7-OptionJ	110.32	82.63	162.57	39.37	394.90
Alt7-OptionK	107.40	82.57	162.64	39.41	392.01
Alt7-OptionL	109.05	82.67	162.58	39.39	393.68
Alt7-OptionM	108.04	82.61	162.60	39.38	392.62

TABLE 10. PLANT AND SYSTEM DEPENDABLE CAPACITY CALCULATIONS FOR NON-FEDERAL PLANTS WITH NO ACTION ALTERNATIVE

Capacity (MW)	Morgan Falls	Bartlett	Goat Rock	Oliver	North Highlands	Non-Federal Dependable Capacity Total
No Action	16.44	195.39	32.49	55.84	31.59	331.74
Alt1-OptionL	16.48	195.71	32.61	55.92	31.63	332.35
Alt7-OptionA	16.31	195.53	32.47	55.92	31.58	331.82
Alt7-OptionB	16.35	195.84	32.74	55.95	31.65	332.54
Alt7-OptionH	16.32	195.82	32.56	55.97	31.64	332.31
Alt7-OptionI	16.29	195.61	32.49	55.92	31.61	331.93
Alt7-OptionJ	16.44	195.98	32.83	55.96	31.68	332.89
Alt7-OptionK	16.29	195.60	32.49	55.92	31.61	331.90
Alt7-OptionL	16.37	196.00	32.63	56.00	31.66	332.66
Alt7-OptionM	16.33	195.74	32.56	55.95	31.63	332.21

TABLE 11. TOTAL SYSTEM DEPENDABLE CAPACITY (FEDERAL AND NON-FEDERAL PLANTS) WITH NO ACTION ALTERNATIVE

Capacity (MW)	Federal Dependable Capacity	Difference From No Action	Non-Federal Dependable Capacity	Difference From No Action	Total	Total Difference from No Action
No Action	394.09		331.74		725.83	0.00
Alt1-OptionL	394.79	0.70	332.35	0.61	727.14	1.31
Alt7-OptionA	392.71	-1.39	331.82	0.08	724.52	-1.31
Alt7-OptionB	394.03	-0.06	332.54	0.80	726.57	0.74
Alt7-OptionH	392.53	-1.57	332.31	0.57	724.84	-1.00
Alt7-OptionI	392.11	-1.99	331.93	0.19	724.03	-1.80
Alt7-OptionJ	394.90	0.81	332.89	1.15	727.79	1.95
Alt7-OptionK	392.01	-2.08	331.90	0.16	723.91	-1.93
Alt7-OptionL	393.68	-0.41	332.66	0.92	726.34	0.51
Alt7-OptionM	392.62	-1.47	332.21	0.47	724.84	-1.00

Capacity Unit Value Calculation

Capacity unit values represent the capital cost and the fixed O&M cost of the most likely thermal generation alternative that would carry the same increment of load as the proposed hydropower project or modification. As discussed below in the screening curve analysis description, the cost effectiveness of the different thermal resources depends on how and when the resource is used. For example, coal-fired plants may be used to replace a base loading hydropower plant while a gas-fired turbine plant may be used to replace a peaking hydropower operation. A combined cycle plant would be used in an intermediate mode of load-following. In this section the process of determining the least costly, most likely combination of thermal generation resources, which comprise the thermal alternative to hydropower, is described. Also, the method calculating the capacity unit value is presented.

Typical Hourly System Generation

To establish the most likely thermal alternative, an analysis of how the hydropower system is currently operated is performed. The goal of this analysis is to show how much capacity can be defined as base load, how much can be defined as intermediate load, and how much can be defined as peaking. Typically the process of computing a capacity value is done on a plant by plant basis, however the necessary data, hourly generation for a typical year was only available for the four USACE plants. In this regard, a total system typical hourly generation exceedance curve is developed.

To produce the total system exceedance chart, two assumptions were made. First, the non-USACE plants acted similar in operation to the four USACE plants. This assumption is reasonable since the non-USACE plants are similarly defined as peaking plants like the USACE facilities. Secondly, a further assumption was made that the USACE hydropower plants' typical year occurred concurrently. With these assumptions the typical hourly generations for the USACE plants were combined and then divided by the Total nameplate capacity of all four USACE plants. This allows for an exceedance curve for percent of nameplate capacity. This can then be made to represent the entire system by simply multiplying the y-axis of the load duration curve by the total system capacity of ACF System. (Figure 7)

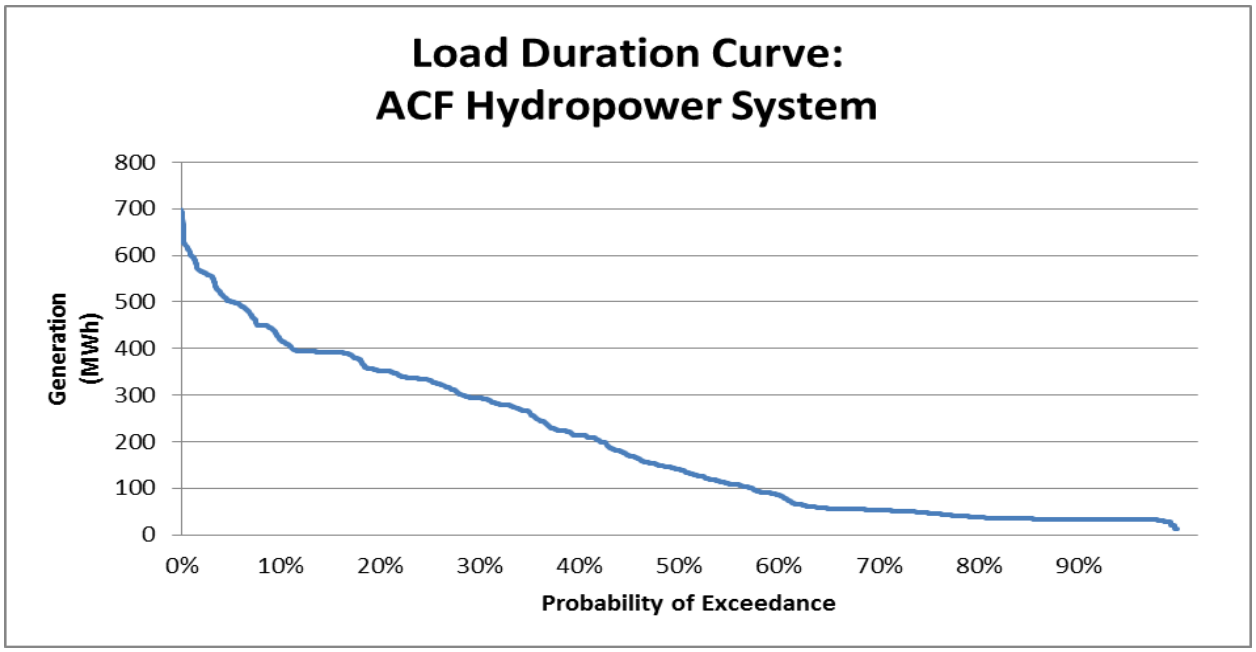

FIGURE 7. LOAD DURATION CURVE FOR ACF WATERSHED HYDROPOWER SYSTEM

Screening Curve Analysis

A screening curve is a plot of annual total plant costs for a thermal generating plant [fixed (capacity) cost plus variable (operating) cost] versus annual plant factor. When this is applied to multiple types of thermal generation resources, the screening curve provides an algebraic way to show which type of thermal generation is the least cost alternative for each plant factor range.

The screening curve assumes a linear function defined by the following equation:

$$AC = CV + (EV * 0.0876 * PF)$$

where: AC = annual thermal generating plant total cost ($/kW-year)

CV = thermal generating plant capacity cost ($/KkW-year)

EV = thermal generating plant operating cost ($/MWh)

Capacity unit values for coal-fired steam, gas-fired combined cycle and combustion turbine plants were computed using procedures developed by the Federal Energy Regulatory Commission (FERC). Capacity values were computed for the SEPA region based on a 2.875 percent interest rate and 2016 price levels. Adjusted capacity values are shown in Table 12. The adjusted capacity values incorporate adjustments to account for differences in reliability and operating flexibility between hydropower and thermal generating power plants. See EM 1110-2-1701, Hydropower, Section 9-5c for further discussion of the capacity value FERC adjustments.

TABLE 12. ADJUSTED CAPACITY AND OPERATING COSTS FOR SEPA REGION (2016$)

Thermal Generating Plant Type	Adjusted Capacity Cost $/KW-Year	Operating Cost $/MWh
Coal-Fired Steam	$278.75	$32.59
Combined Cycle	$175.75	$31.46
Combustion Turbine	$93.78	$48.50

Operating costs for coal-fired steam, gas-fired combined cycle and gas-fired combustion turbine plants were developed using information obtained from the publication *EIA Electric Power Monthly (DOE/EIA-0226)* and other sources. The information obtained included fuel costs, heat rates and variable O&M costs. Since current USACE policy does not allow the use of real fuel cost escalation, these values were assumed to apply over the entire period of analysis.

The plot for each thermal generation type was developed by computing the annual plant cost for various plant factors ranging from zero to 100 percent. The plots are shown in Figure 8.

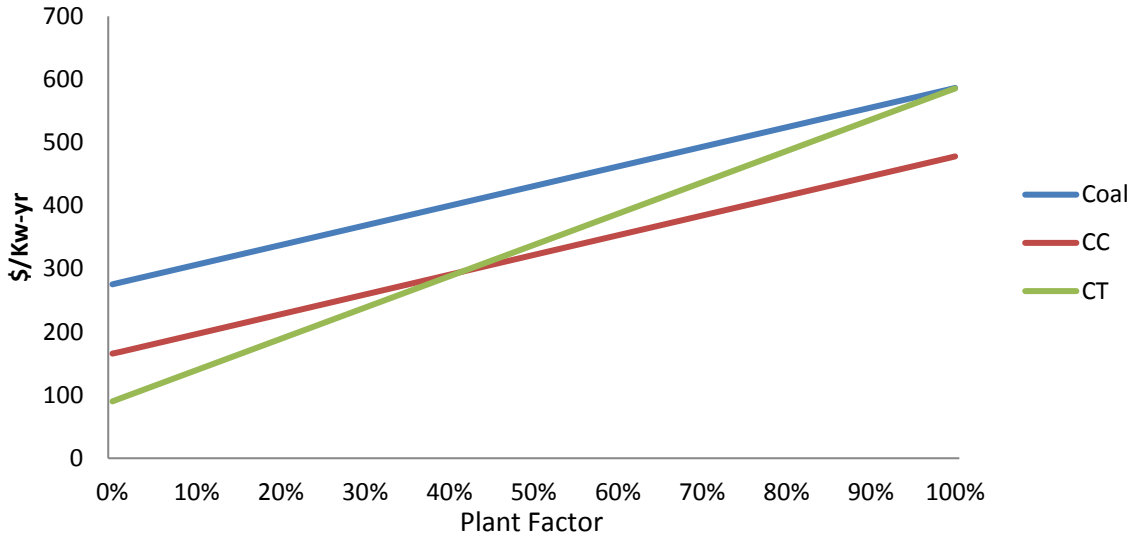

FIGURE 8. REGIONAL SCREENING CURVE FOR VARIOUS THERMAL ALTERNATIVES IN THE SEPA REGION

Composite Unit Capacity Value

The process for calculating the composite unit capacity value for the ACF River Basin System is described by the following algorithm and is illustrated in Figure 9.

Composite Unit Capacity Algorithm:

The following is the algorithm used to compute composite unit capacity.

1. From the screening curve, determine the "breakpoints" (the plant factors at which the least cost plant type changes).
2. Find the points on the generation-duration curve where the percent of time generation is numerically identical to the plant factor breakpoints defined in the preceding step; these intersection points define the portion of the generation that would be carried by each thermal generation plant type.
3. Calculate percent of total generating capacity for each thermal alternative using the portions defined in step 2.
4. Calculate the composite unit capacity of the system as an average of each the thermal alternative's capacity cost weighted by their percent of total generating capacity defined in step 3.

The composite unit capacity values are computed for ACF River Basin System is calculated in Table 13.

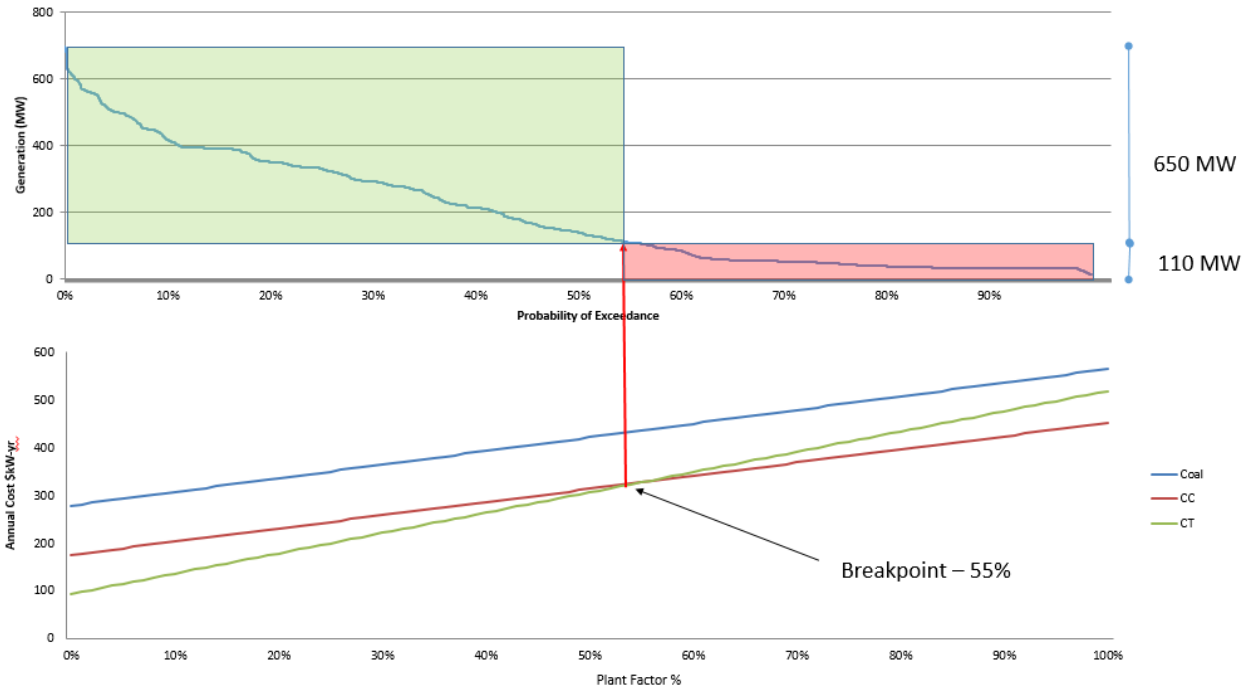

FIGURE 9. ILLUSTRATIVE EXAMPLE OF COMPOSITE UNIT CAPACITY VALUE FOR ACF RIVER BASIN HYDROPOWER SYSTEM

TABLE 13. COMPOSITE UNIT CAPACITY VALUE FOR ACF SYSTEM

Total System	Estimated Replacement Capacity (MW)	Percentage of total Generating Capacity (MW)	Capacity Cost ($/KW-yr)	Weighted Value ($)	
Combustion Turbine	650.44	0.855	93.78	80.21	
Combined Cycle	110	0.145	175.75	25.42	
Coal	0	0	278.75	0	
			2016 $	$105.64	weighted average ($/KW-yr)

Dependable Capacity Value

The dependable capacity value is computed as the product of the systems dependable capacity (MW) and the composite unit capacity value ($/MW) that reflects the most likely thermal alternative shown in Table 13. Tables 14, 15, 16 shows the dependable capacity values for Federal Plants, Non-Federal plants, and the combination as compared to the No Action alternative.

TABLE 14. PLANT AND SYSTEM CAPACITY VALUES FOR FEDERAL PLANTS FOR ALL ALTERNATIVES (2016$)

Capacity (MW)	Buford	West Point	Walter F George	Jim Woodruff	Federal Dependable Capacity Total
No Action	$11,646,034	$8,693,608	$17,127,790	$4,163,549	$41,630,980
Alt1-OptionL	$11,681,819	$8,719,354	$17,139,792	$4,163,609	$41,704,574
Alt7-OptionA	$11,442,095	$8,707,392	$17,173,743	$4,160,984	$41,484,214
Alt7-OptionB	$11,582,503	$8,721,115	$17,162,061	$4,158,606	$41,624,286
Alt7-OptionH	$11,380,799	$8,738,637	$17,182,794	$4,163,110	$41,465,340
Alt7-OptionI	$11,354,763	$8,724,640	$17,178,652	$4,162,962	$41,421,018
Alt7-OptionJ	$11,654,351	$8,729,037	$17,173,643	$4,159,240	$41,716,272
Alt7-OptionK	$11,345,074	$8,722,311	$17,180,346	$4,163,177	$41,410,908
Alt7-OptionL	$11,519,960	$8,732,731	$17,174,110	$4,160,570	$41,587,370
Alt7-OptionM	$11,413,151	$8,726,381	$17,176,216	$4,159,923	$41,475,671

TABLE 15. PLANT AND SYSTEM CAPACITY VALUES FOR NON-FEDERAL PLANTS FOR ALL ALTERNATIVES (2016$)

Capacity (MW)	Morgan Falls	Bartlett	Goat Rock	Oliver	North Highlands	Non-Federal Dependable Capacity Total
No Action	$1,736,275	$20,639,925	$3,432,275	$5,898,838	$3,336,731	$35,044,043
Alt1-OptionL	$1,741,178	$20,673,988	$3,445,296	$5,906,837	$3,341,171	$35,108,469
Alt7-OptionA	$1,722,638	$20,655,482	$3,430,257	$5,907,441	$3,336,238	$35,052,056
Alt7-OptionB	$1,727,535	$20,688,393	$3,458,294	$5,910,871	$3,343,645	$35,128,737
Alt7-OptionH	$1,724,038	$20,686,014	$3,439,354	$5,912,051	$3,342,733	$35,104,190
Alt7-OptionI	$1,720,887	$20,663,776	$3,432,582	$5,906,842	$3,339,553	$35,063,640
Alt7-OptionJ	$1,736,774	$20,702,646	$3,467,849	$5,911,700	$3,346,053	$35,165,022
Alt7-OptionK	$1,720,325	$20,662,510	$3,431,750	$5,906,701	$3,339,286	$35,060,571
Alt7-OptionL	$1,729,407	$20,704,372	$3,447,110	$5,915,731	$3,344,450	$35,141,070
Alt7-OptionM	$1,724,963	$20,677,834	$3,439,645	$5,910,449	$3,340,993	$35,093,885

TABLE 16. SYSTEM CAPACITY VALUES FOR FEDERAL AND NON-FEDERAL PLANTS FOR ALL ALTERNATIVES (2016$)

	Federal Dependable Capacity	Non-Federal Dependable Capacity	Total
No Action	$41,630,980	$35,044,043	$76,675,023
Alt1-OptionL	$41,704,574	$35,108,469	$76,813,043
Alt7-OptionA	$41,484,214	$35,052,056	$76,536,270
Alt7-OptionB	$41,624,286	$35,128,737	$76,753,023
Alt7-OptionH	$41,465,340	$35,104,190	$76,569,530
Alt7-OptionI	$41,421,018	$35,063,640	$76,484,658
Alt7-OptionJ	$41,716,272	$35,165,022	$76,881,293
Alt7-OptionK	$41,410,908	$35,060,571	$76,471,479
Alt7-OptionL	$41,587,370	$35,141,070	$76,728,440
Alt7-OptionM	$41,475,671	$35,093,885	$76,569,556

Hydropower Benefits Foregone

The following tables present a summary of the energy, capacity and total hydropower benefits of the nine alternatives. Benefits are calculated as a difference from a defined alternative. In this section there are two groupings with a different alternative for comparison.

1) All Alternatives with No Action as baseline
2) Alt7 Alternatives with Alt7-OptionJ as baseline

Energy Benefits:

Tables 17, 18, and 19 show the energy benefits by plant as compared to the No Action alternative. Tables 20, 21, and 22 show the energy benefits by plant as compared to the Alt7-OptionJ alternative.

TABLE 17. ENERGY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER FEDERAL PLANTS - ALL ALTERNATIVES COMPARED TO NO ACTION (2016$)

	Buford	Buford Difference	West Point	West Point Difference	Walter F George	Walter F George Difference	Jim Woodruff	Jim Woodruff Difference	Total Federal Energy Value	Total Federal Energy Value Difference
No Action	$6,249,655		$8,401,350		$21,906,299		$10,998,460		$47,555,765	
Alt1-OptionL	$6,237,253	($12,402)	$8,501,730	$100,380	$22,016,947	$110,648	$11,013,238	$14,777	$47,769,168	$213,404
Alt7-OptionA	$6,235,148	($14,507)	$8,389,401	($11,949)	$21,871,504	($34,795)	$10,980,148	($18,313)	$47,476,200	($79,564)
Alt7-OptionB	$6,838,378	$588,723	$8,602,616	$201,267	$22,102,969	$196,670	$10,996,858	($1,602)	$48,540,822	$985,057
Alt7-OptionH	$5,895,821	($353,834)	$8,397,253	($4,096)	$21,880,835	($25,464)	$10,996,236	($2,225)	$47,170,145	($385,620)
Alt7-OptionI	$5,901,995	($347,660)	$8,375,963	($25,387)	$21,856,884	($49,415)	$10,990,634	($7,827)	$47,125,475	($430,289)
Alt7-OptionJ	$6,833,172	$583,516	$8,702,600	$301,250	$22,217,627	$311,328	$11,012,505	$14,045	$48,765,904	$1,210,139
Alt7-OptionK	$5,873,796	($375,859)	$8,366,414	($34,936)	$21,846,725	($59,574)	$10,990,583	($7,878)	$47,077,518	($478,246)
Alt7-OptionL	$6,229,002	($20,653)	$8,490,763	$89,413	$21,983,290	$76,991	$11,000,033	$1,573	$47,703,087	$147,323
Alt7-OptionM	$6,081,520	($168,135)	$8,438,877	$37,527	$21,927,026	$20,727	$10,995,719	($2,742)	$47,443,141	($112,623)

TABLE 18. ENERGY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER NON-FEDERAL PLANTS - ALL ALTERNATIVES COMPARED TO NO ACTION (2016$)

	Morgan Falls	Morgan Falls Difference	Bartlett	Bartlett Difference	Goat Rock	Goat Rock Difference	Oliver	Oliver Difference	North Highlands	North Highlands Difference	Total Non-Federal Energy Value	Total Non-Federal Energy Value
No Action	$2,898,542		$19,183,268		$8,566,739		$10,743,894		$6,022,906		$47,415,349	
Alt1-OptionL	$2,904,318	$5,777	$19,337,909	$154,641	$8,626,421	$59,682	$10,821,033	$77,139	$6,064,772	$41,866	$47,754,452	$339,103
Alt7-OptionA	$2,882,465	($16,077)	$19,162,476	($20,792)	$8,540,103	($26,636)	$10,716,874	($27,021)	$6,006,383	($16,522)	$47,308,301	($107,048)
Alt7-OptionB	$2,996,394	$97,852	$19,524,311	$341,043	$8,654,700	$87,961	$10,874,519	$130,625	$6,087,828	$64,922	$48,137,752	$722,403
Alt7-OptionH	$2,828,286	($70,256)	$19,159,988	($23,280)	$8,557,933	($8,806)	$10,729,693	($14,202)	$6,016,656	($6,250)	$47,292,556	($122,793)
Alt7-OptionI	$2,826,139	($72,403)	$19,130,175	($53,093)	$8,542,595	($24,144)	$10,712,278	($31,616)	$6,006,910	($15,996)	$47,218,097	($197,252)
Alt7-OptionJ	$3,003,097	$104,556	$19,681,330	$498,062	$8,715,039	$148,300	$10,952,497	$208,603	$6,130,289	$107,384	$48,482,253	$1,066,904
Alt7-OptionK	$2,820,918	($77,624)	$19,114,527	($68,741)	$8,538,120	($28,619)	$10,704,914	($38,980)	$6,003,413	($19,493)	$47,181,893	($233,456)
Alt7-OptionL	$2,890,201	($8,341)	$19,322,316	$139,048	$8,603,429	$36,690	$10,795,471	$51,577	$6,049,862	$26,956	$47,661,279	$245,930
Alt7-OptionM	$2,861,605	($36,936)	$19,236,390	$53,122	$8,576,061	$9,322	$10,757,526	$13,632	$6,030,354	$7,448	$47,461,937	$46,588

TABLE 19. ENERGY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALTERNATIVES COMPARED TO NO ACTION (2016$)

	Total Energy Value	Energy Benefit Difference from Baseline (No Action)
No Action	$94,971,114	
Alt1-OptionL	$95,523,621	$552,507
Alt7-OptionA	$94,784,501	($186,612)
Alt7-OptionB	$96,678,574	$1,707,460
Alt7-OptionH	$94,462,701	($508,413)
Alt7-OptionI	$94,343,573	($627,541)
Alt7-OptionJ	$97,248,157	$2,277,043
Alt7-OptionK	$94,259,411	($711,703)
Alt7-OptionL	$95,364,366	$393,253
Alt7-OptionM	$94,905,078	($66,036)

TABLE 20. ENERGY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER FEDERAL PLANTS - ALL ALTERNATIVES COMPARED TO ALT7-OPTIONJ (2016$)

	Buford	Buford Difference	West Point	West Point Difference	Walter F George	Walter F George Difference	Jim Woodruff	Jim Woodruff Difference	Total Federal Energy Value	Total Federal Energy Value Difference
Alt7-OptionJ	$6,833,172		$8,702,600		$22,217,627		$11,012,505		$48,765,904	
Alt7-OptionA	$6,235,148	($598,024)	$8,389,401	($313,199)	$21,871,504	($346,123)	$10,980,148	($32,358)	$47,476,200	($1,289,704)
Alt7-OptionB	$6,838,378	$5,207	$8,602,616	($99,983)	$22,102,969	($114,659)	$10,996,858	($15,647)	$48,540,822	($225,082)
Alt7-OptionH	$5,895,821	($937,350)	$8,397,253	($305,346)	$21,880,835	($336,793)	$10,996,236	($16,270)	$47,170,145	($1,595,759)
Alt7-OptionI	$5,901,995	($931,177)	$8,375,963	($326,637)	$21,856,884	($360,743)	$10,990,634	($21,872)	$47,125,475	($1,640,428)
Alt7-OptionK	$5,873,796	($959,375)	$8,366,414	($336,186)	$21,846,725	($370,902)	$10,990,583	($21,923)	$47,077,518	($1,688,385)
Alt7-OptionL	$6,229,002	($604,170)	$8,490,763	($211,837)	$21,983,290	($234,338)	$11,000,033	($12,472)	$47,703,087	($1,062,817)
Alt7-OptionM	$6,081,520	($751,651)	$8,438,877	($263,723)	$21,927,026	($290,601)	$10,995,719	($16,787)	$47,443,141	($1,322,763)
Alt7-OptionJ	$6,833,172		$8,702,600		$22,217,627		$11,012,505		$48,765,904	

TABLE 21. ENERGY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER FEDERAL PLANTS - ALL ALTERNATIVES COMPARED TO ALT7-OPTIONJ (2016$)

	Morgan Falls	Morgan Falls Difference	Bartlett	Bartlett Difference	Goat Rock	Goat Rock Difference	Oliver	Oliver Difference	North Highlands	North Highlands Difference	Total Non-Federal Energy Value	Total Non-Federal Energy Value
Alt7-OptionJ	$3,003,097		$19,681,330		$8,715,039		$10,952,497		$6,130,289		$48,482,253	
Alt7-OptionA	$2,882,465	($120,632)	$19,162,476	($518,854)	$8,540,103	($174,936)	$10,716,874	($235,624)	$6,006,383	($123,906)	$47,308,301	($1,173,952)
Alt7-OptionB	$2,996,394	($6,704)	$19,524,311	($157,019)	$8,654,700	($60,338)	$10,874,519	($77,978)	$6,087,828	($42,462)	$48,137,752	($344,501)
Alt7-OptionH	$2,828,286	($174,811)	$19,159,988	($521,342)	$8,557,933	($157,105)	$10,729,693	($222,805)	$6,016,656	($113,634)	$47,292,556	($1,189,697)
Alt7-OptionI	$2,826,139	($176,958)	$19,130,175	($551,155)	$8,542,595	($172,443)	$10,712,278	($240,220)	$6,006,910	($123,380)	$47,218,097	($1,264,156)
Alt7-OptionK	$2,820,918	($182,180)	$19,114,527	($566,803)	$8,538,120	($176,919)	$10,704,914	($247,583)	$6,003,413	($126,876)	$47,181,893	($1,300,360)
Alt7-OptionL	$2,890,201	($112,896)	$19,322,316	($359,014)	$8,603,429	($111,610)	$10,795,471	($157,026)	$6,049,862	($80,428)	$47,661,279	($820,974)
Alt7-OptionM	$2,861,605	($141,492)	$19,236,390	($444,940)	$8,576,061	($138,977)	$10,757,526	($194,971)	$6,030,354	($99,935)	$47,461,937	($1,020,316)
Alt7-OptionJ	$3,003,097		$19,681,330		$8,715,039		$10,952,497		$6,130,289		$48,482,253	

Table 22. Energy Benefits for the ACF River Basin Hydropower System Alt7 alternatives compared to Alt7-OptionJ (2016$)

	Total Energy Value	Energy Benefit Difference from Baseline (Alt7-OptionJ)
Alt7-OptionJ	$97,248,157	
Alt7-OptionA	$94,784,501	($2,463,656)
Alt7-OptionB	$96,678,574	($569,583)
Alt7-OptionH	$94,462,701	($2,785,456)
Alt7-OptionI	$94,343,573	($2,904,584)
Alt7-OptionK	$94,259,411	($2,988,746)
Alt7-OptionL	$95,364,366	($1,883,791)
Alt7-OptionM	$94,905,078	($2,343,079)

Capacity Benefits:

Tables 23 and 24 show the dependable capacity benefits for each alternative as compared to the No Action and Alt7-OptionJ alternatives.

TABLE 23. CAPACITY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALL ALTERNATIVES COMPARED TO NO ACTION (2016$)

	Federal Dependable Capacity Value	Federal Capacity Benefit Difference from No Action	Non-Federal Dependable Capacity Value	Non-Federal Capacity Benefit Difference from No Action	Total Dependable Capacity Value	Total Capacity Benefit Difference from No Action
No Action	$41,630,980	$0	$35,044,043	$0	$76,675,023	$0
Alt1-OptionL	$41,704,574	$73,594	$35,108,469	$64,426	$76,813,043	$138,020
Alt7-OptionA	$41,484,214	($146,766)	$35,052,056	$8,013	$76,536,270	($138,753)
Alt7-OptionB	$41,624,286	($6,694)	$35,128,737	$84,694	$76,753,023	$78,000
Alt7-OptionH	$41,465,340	($165,640)	$35,104,190	$60,146	$76,569,530	($105,494)
Alt7-OptionI	$41,421,018	($209,962)	$35,063,640	$19,597	$76,484,658	($190,365)
Alt7-OptionJ	$41,716,272	$85,292	$35,165,022	$120,978	$76,881,293	$206,270
Alt7-OptionK	$41,410,908	($220,072)	$35,060,571	$16,528	$76,471,479	($203,544)
Alt7-OptionL	$41,587,370	($43,610)	$35,141,070	$97,027	$76,728,440	$53,417
Alt7-OptionM	$41,475,671	($155,309)	$35,093,885	$49,842	$76,569,556	($105,467)

TABLE 24. CAPACITY BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALT7 ALTERNATIVES COMPARED TO ALT7-OPTIONJ (2016$)

	Federal Dependable Capacity Value	Federal Capacity Benefit Difference from Alt7_OptJN0	Non-Federal Dependable Capacity Value	Non-Federal Capacity Benefit Difference from Alt7_OptJN0	Total Dependable Capacity Value	Total Capacity Benefit Difference from Alt7-OptionJ
Alt7-OptionJ	$41,716,272	$0	$35,165,022	$0	$76,881,293	$0
Alt7-OptionA	$41,484,214	($237,382)	$35,052,056	($126,774)	$76,536,270	($364,156)
Alt7-OptionB	$41,624,286	($93,299)	$35,128,737	($39,619)	$76,753,023	($132,918)
Alt7-OptionH	$41,465,340	($209,359)	$35,104,190	($69,555)	$76,569,530	($278,915)
Alt7-OptionI	$41,421,018	($260,452)	$35,063,640	($111,578)	$76,484,658	($372,030)
Alt7-OptionK	$41,410,908	($270,266)	$35,060,571	($114,753)	$76,471,479	($385,018)
Alt7-OptionL	$41,587,370	($120,575)	$35,141,070	($36,573)	$76,728,440	($157,148)
Alt7-OptionM	$41,475,671	($186,010)	$35,093,885	($82,296)	$76,569,556	($268,306)

Total Hydropower Benefits:

Tables 25, 26, and 27 show the total hydropower benefits (capacity and energy) for each set of comparisons.

TABLE 25. TOTAL HYDROPOWER BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALL ALTERNATIVES COMPARED TO NO ACTION (2016$)

	Energy Value	Capacity Value	Total Value	Benefits Foregone compared to No Action
No Action	$94,971,114	$76,675,023	$171,646,137	$0
Alt1-OptionL	$95,523,621	$76,813,043	$172,336,664	$690,527
Alt7-OptionA	$94,784,501	$76,536,270	$171,320,772	($325,365)
Alt7-OptionB	$96,678,574	$76,753,023	$173,431,597	$1,785,460
Alt7-OptionH	$94,462,701	$76,569,530	$171,032,231	($613,907)
Alt7-OptionI	$94,343,573	$76,484,658	$170,828,231	($817,906)
Alt7-OptionJ	$97,248,157	$76,881,293	$174,129,450	$2,483,313
Alt7-OptionK	$94,259,411	$76,471,479	$170,730,890	($915,247)
Alt7-OptionL	$95,364,366	$76,728,440	$172,092,807	$446,669
Alt7-OptionM	$94,905,078	$76,569,556	$171,474,634	($171,503)

TABLE 26. TOTAL HYDROPOWER BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALT7 ALTERNATIVES COMPARED TO ALT7-OPTIONJ (2016$)

	Energy Value	Capacity Value	Total Value	Benefits Foregone compared to Alt7-OptionJ
Alt7-OptionJ	$97,248,157	$76,881,293	$174,129,450	$0
Alt7-OptionA	$94,784,501	$76,536,270	$171,320,772	($2,808,679)
Alt7-OptionB	$96,678,574	$76,753,023	$173,431,597	($697,853)
Alt7-OptionH	$94,462,701	$76,569,530	$171,032,231	($3,097,220)
Alt7-OptionI	$94,343,573	$76,484,658	$170,828,231	($3,301,220)
Alt7-OptionK	$94,259,411	$76,471,479	$170,730,890	($3,398,560)
Alt7-OptionL	$95,364,366	$76,728,440	$172,092,807	($2,036,644)
Alt7-OptionM	$94,905,078	$76,569,556	$171,474,634	($2,654,816)

FEDERAL BENEFITS

For some calculations, it is necessary to look at the Federal Benefits by themselves. This section calculates three metrics of Federal Benefits; benefits foregone, replacement cost of power, and revenue foregone. These benefits are calculated as a difference from a defined alternative. In this section we analyze two groupings:

1) All Alternatives with No Action alternative comparison

2) Alt7 Alternatives with Alt7-OptionJ alternative comparison

Benefits Foregone: (Replacement Costs of Power)

Tables 27, 28, and 29 calculates the benefits foregone for the two groupings described above.

TABLE 27. FEDERAL HYDROPOWER VALUE FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALL ALTERNATIVES COMPARED TO NO ACTION (2016$)

	Energy Value (Federal System)	Capacity Value (Federal System)	Total Value (Federal System)	Benefits Foregone compared to No Action
No Action	$47,555,765	$41,630,980	$89,186,745	$0
Alt1-OptionL	$47,769,168	$41,704,574	$89,473,742	$286,998
Alt7-OptionA	$47,476,200	$41,484,214	$88,960,414	($226,330)
Alt7-OptionB	$48,540,822	$41,624,286	$90,165,108	$978,363
Alt7-OptionH	$47,170,145	$41,465,340	$88,635,485	($551,259)
Alt7-OptionI	$47,125,475	$41,421,018	$88,546,493	($640,251)
Alt7-OptionJ	$48,765,904	$41,716,272	$90,482,176	$1,295,431
Alt7-OptionK	$47,077,518	$41,410,908	$88,488,426	($698,318)
Alt7-OptionL	$47,703,087	$41,587,370	$89,290,457	$103,712
Alt7-OptionM	$47,443,141	$41,475,671	$88,918,812	($267,932)

TABLE 28. FEDERAL HYDROPOWER BENEFITS FOR THE ACF RIVER BASIN HYDROPOWER SYSTEM ALT7 ALTERNATIVES COMPARED TO ALT7-OPTIONJ (2016$)

	Energy Value (Federal System)	Capacity Value (Federal System)	Total Value (Federal System)	Benefits Foregone compared to Alt7-OptionJ
Alt7-OptionJ	$48,765,904	$41,716,272	$90,482,176	$0
Alt7-OptionA	$47,476,200	$41,484,214	$88,960,414	($1,521,761)
Alt7-OptionB	$48,540,822	$41,624,286	$90,165,108	($317,068)
Alt7-OptionH	$47,170,145	$41,465,340	$88,635,485	($1,846,690)
Alt7-OptionI	$47,125,475	$41,421,018	$88,546,493	($1,935,682)
Alt7-OptionK	$47,077,518	$41,410,908	$88,488,426	($1,993,749)
Alt7-OptionL	$47,703,087	$41,587,370	$89,290,457	($1,191,718)
Alt7-OptionM	$47,443,141	$41,475,671	$88,918,812	($1,563,363)

Revenue Foregone

SEPA markets its power charging both a capacity rate and an energy rate (Tables 29 and 30). The revenue SEPA generates is created from a fixed capacity charge defined by its marketable capacity explained in Table 1 and the variable annual generation.

TABLE 29. CAPACITY AND ENERGY RATE AS REPORTED IN THE SEPA 2013 ANNUAL REPORT FOR JIM WOODRUFF AND GEORGIA-ALABAMA-SOUTH CAROLINA SYSTEM (GASC) (2013$)

System	Capacity Rate	Energy Rate
Jim Woodruff	10.29 $/kW/Month	26.51 mills/kWh
GASC (Buford, West Point, and Walter F George)	4.81 $/kW/Month	12.33 mills/kWh

TABLE 30. CAPACITY AND ENERGY RATE AS REPORTED IN THE SEPA 2013 ANNUAL REPORT FOR JIM WOODRUFF AND GEORGIA-ALABAMA-SOUTH CAROLINA SYSTEM (GASC) (2016$)

System	Capacity Rate	Energy Rate
Jim Woodruff	10.78 $/kW/Month	27.76 mills/kWh
GASC (Buford, West Point, and Walter F George)	5.04 $/kW/Month	12.91 mills/kWh

Using the average annual generation calculated for the Federal plants, Table 31 lists the estimated energy revenue for all alternatives.

TABLE 31. ENERGY REVENUES CALCULATED FOR ALL ALTERNATIVES

Alternatives	Average Annual Generation (MWh)		Energy rate(2016) $/MWh		Estimated Energy Revenue (2016$)
	GASC (Buford, West Point, and Walter F George)	Jim Woodruff	GASC	Jim Woodruff	
No Action	768,098	254,312	$12.91	$27.76	$16,975,845
Alt1-OptionL	772,835	254,713	$12.91	$27.76	$17,048,141
Alt7-OptionA	767,631	254,021	$12.91	$27.76	$16,961,728
Alt7-OptionB	791,026	254,526	$12.91	$27.76	$17,277,784
Alt7-OptionH	760,585	254,410	$12.91	$27.76	$16,881,588
Alt7-OptionI	759,786	254,266	$12.91	$27.76	$16,867,269
Alt7-OptionJ	795,720	254,949	$12.91	$27.76	$17,350,138
Alt7-OptionK	758,686	254,264	$12.91	$27.76	$16,853,002
Alt7-OptionL	772,312	254,537	$12.91	$27.76	$17,036,494
Alt7-OptionM	766,694	254,418	$12.91	$27.76	$16,960,650

Capacity Revenues are based on the estimated changes in dependable capacity as calculated in Tables 8-10. Table 32 shows the capacity revenues for all alternatives, using the No Action as the basis for comparison.

TABLE 32. CAPACITY REVENUE CALCULATED FOR ALL ALTERNATIVES (2016$)

Alternatives	Estimated Marketable Capacity (KW)		Capacity rate(2016) $/kW/Month		Estimated Capacity Revenue (2016$)
	GASC (Buford, West Point, and Walter F George)	Jim Woodruff	GASC	Jim Woodruff	System
No Action	354,681	39,414	$4.81	$10.59	$25,480,882
Alt1-OptionL	355,377	39,414	$4.81	$10.59	$25,521,133
Alt7-OptionA	353,316	39,389	$4.81	$10.59	$25,399,005
Alt7-OptionB	354,664	39,367	$4.81	$10.59	$25,473,979
Alt7-OptionH	353,117	39,410	$4.81	$10.59	$25,390,088
Alt7-OptionI	352,699	39,408	$4.81	$10.59	$25,365,773
Alt7-OptionJ	355,529	39,373	$4.81	$10.59	$25,524,656
Alt7-OptionK	352,601	39,410	$4.81	$10.59	$25,360,390
Alt7-OptionL	354,296	39,386	$4.81	$10.59	$25,455,097
Alt7-OptionM	353,245	39,379	$4.81	$10.59	$25,393,641

Table 33 shows the combined capacity and energy revenues for each alternative.

TABLE 33. ESTIMATED FEDERAL REVENUE FOR ALL ALTERNATIVES (2016$)

Alternatives	Estimated Energy Revenue (2016$)	Estimated Capacity Revenue (2016$)	Total Revenue (2016$)
No Action	$16,975,845	$25,480,882	$42,456,727
Alt1-OptionL	$17,048,141	$25,521,133	$42,569,274
Alt7-OptionA	$16,961,728	$25,399,005	$42,360,733
Alt7-OptionB	$17,277,784	$25,473,979	$42,751,763
Alt7-OptionH	$16,881,588	$25,390,088	$42,271,677
Alt7-OptionI	$16,867,269	$25,365,773	$42,233,042
Alt7-OptionJ	$17,350,138	$25,524,656	$42,874,794
Alt7-OptionK	$16,853,002	$25,360,390	$42,213,392
Alt7-OptionL	$17,036,494	$25,455,097	$42,491,591
Alt7-OptionM	$16,960,650	$25,393,641	$42,354,291

Tables 34 and 35 show the revenue foregone for the two groupings described at the beginning of the section.

TABLE 34. REVENUE FOREGONE FOR ALL ALTERNATIVES COMPARED TO NO ACTION (2016$)

Alternatives	Estimated Energy Revenue (2016$)	Estimated Energy Revenue Forgone (2016$)	Estimated Capacity Revenue (2016$)	Estimated Capacity Revenue Foregone (2016$)	Total Revenue Foregone (2016$)
No Action	$16,975,845	$0	$25,480,882	$0	$0
Alt1-OptionL	$17,048,141	$72,296	$25,521,133	$40,251	$112,547
Alt7-OptionA	$16,961,728	($86,413)	$25,399,005	($122,128)	($208,541)
Alt7-OptionB	$17,277,784	$316,056	$25,473,979	$74,974	$391,030
Alt7-OptionH	$16,881,588	($396,195)	$25,390,088	($83,891)	($480,086)
Alt7-OptionI	$16,867,269	($14,319)	$25,365,773	($24,315)	($38,635)
Alt7-OptionJ	$17,350,138	$482,869	$25,524,656	$158,883	$641,751
Alt7-OptionK	$16,853,002	($497,136)	$25,360,390	($164,266)	($661,401)
Alt7-OptionL	$17,036,494	$183,492	$25,455,097	$94,707	$278,198
Alt7-OptionM	$16,960,650	($75,843)	$25,393,641	($61,456)	($137,300)

TABLE 35. REVENUE FOREGONE FOR ALT7 ALTERNATIVES COMPARED TO ALT7-OPTIONJ (2016$)

Alternatives	Estimated Energy Revenue (2016$)	Estimated Energy Revenue Forgone (2016$)	Estimated Capacity Revenue (2016$)	Estimated Capacity Revenue Foregone (2016$)	Total Revenue Foregone (2016$)
Alt7-OptionJ	$17,350,138	$0	$25,360,571	$0	$0
Alt7-OptionA	$16,975,845	($374,292)	$25,232,093	($128,479)	($502,771)
Alt7-OptionB	$17,277,784	($72,354)	$25,309,222	($51,349)	($123,703)
Alt7-OptionH	$16,881,588	($468,549)	$25,248,749	($111,823)	($580,372)
Alt7-OptionI	$16,867,269	($482,869)	$25,220,747	($139,824)	($622,693)
Alt7-OptionK	$16,853,002	($497,136)	$25,215,525	($145,047)	($642,182)
Alt7-OptionL	$17,036,494	($313,644)	$25,295,628	($64,944)	($378,588)
Alt7-OptionM	$16,960,650	($389,487)	$25,259,482	($101,089)	($490,577)

Credits to the Power Marketing Agency (PMA):

Project costs originally allocated to hydropower are being repaid through power revenues which are based on rates designed by the Federal power marketing agency (PMA) to recover allocated costs plus interest within 50 years of the date of commercial power operation. If a portion of the storage is reallocated from hydropower to water supply, the PMA's repayment obligation must be reduced in proportion to the lost energy and marketable capacity.

Planning Guidance Notebook, Appendix E-57d(3) of ER 1105-2-100 (22 April 2002) states that;

> "If hydropower revenues are being reduced as a result of the reallocation, the power marketing agency will be credited for the amount of revenues to the Treasury foregone as a result of the reallocation assuming uniform annual repayment."

Paragraph d(2)(b) states that;

> "Revenues foregone to hydropower are the reduction in revenues accruing to the Treasury as a result of the reduction in hydropower outputs based on the Baseline rates charged by the power marketing agency. Revenues foregone from other project purposes are the reduction in revenues accruing to the Treasury based on any Baseline repayment agreements."

The reduction in revenues for energy and capacity charges presented in Table 36.
ER 1105-2-100 also allows the marketing agency credit for any additional costs above the lost revenue to recover costs of purchased power to meet the obligations of the current power sales contract(s) relating to the marketing of power from the hydro project(s) where storage is being reallocated. The continuation of Appendix E-57d(3), provides the following guidance:

> "In instances where Baseline contracts between the power marketing agency and their customer would result in a cost to the Federal Government to acquire replacement power to fulfill the obligations of contracts, an additional credit to the power marketing agency can be made for such costs incurred during the remaining period of the contracts."

In both cases the credit in each year will be based on the revenue actually lost or the replacement costs actually incurred (and documented) by the power marketing agency. However, for purposes of providing an estimate of this credit, the cost of replacement power and revenue foregone will be estimated using the procedures described above.

Remaining Period of Contract:

The length of time remaining under the current power sales contracts had to be identified to determine how many years the PMA credit would be based on cost of replacement power. It is understood through conversations with the PMA that contracts are adjusted every five years with the current set of contracts set to expire in 2017. For this estimation for credits to the PMA it is assumed that a contract will be in place extending to 2022.

Credits to the PMA Calculations:

The computation for credits to the PMA is estimated to be the replacement cost of power (benefits foregone) for the ensuing period of contracts, and then the revenue foregone for the remaining 50 years.

The tables below show the Credits to the PMA calculated for all iterations of Alt7 as compared to Alt7-OptionJ.

Table 36. Estimated Credits to the PMA Alt7-OptionA

Alt7_OptAN0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$1,521,761	$1,521,761
2018			$1,521,761	$1,521,761
2019			$1,521,761	$1,521,761
2020			$1,521,761	$1,521,761
2021			$1,521,761	$1,521,761
2022	$128,479	$374,292		$502,771
2023	$128,479	$374,292		$502,771
2024	$128,479	$374,292		$502,771
2025	$128,479	$374,292		$502,771
2026	$128,479	$374,292		$502,771
2027	$128,479	$374,292		$502,771
2028	$128,479	$374,292		$502,771
2029	$128,479	$374,292		$502,771
2030	$128,479	$374,292		$502,771
2031	$128,479	$374,292		$502,771
2032	$128,479	$374,292		$502,771
2033	$128,479	$374,292		$502,771
2034	$128,479	$374,292		$502,771
2035	$128,479	$374,292		$502,771
2036	$128,479	$374,292		$502,771
2037	$128,479	$374,292		$502,771
2038	$128,479	$374,292		$502,771
2039	$128,479	$374,292		$502,771
2040	$128,479	$374,292		$502,771
2041	$128,479	$374,292		$502,771
2042	$128,479	$374,292		$502,771
2043	$128,479	$374,292		$502,771
2044	$128,479	$374,292		$502,771
2045	$128,479	$374,292		$502,771
2046	$128,479	$374,292		$502,771
2047	$128,479	$374,292		$502,771
2048	$128,479	$374,292		$502,771
2049	$128,479	$374,292		$502,771
2050	$128,479	$374,292		$502,771
2051	$128,479	$374,292		$502,771
2052	$128,479	$374,292		$502,771
2053	$128,479	$374,292		$502,771
2054	$128,479	$374,292		$502,771
2055	$128,479	$374,292		$502,771
2056	$128,479	$374,292		$502,771
2057	$128,479	$374,292		$502,771
2058	$128,479	$374,292		$502,771
2059	$128,479	$374,292		$502,771
2060	$128,479	$374,292		$502,771
2061	$128,479	$374,292		$502,771
2062	$128,479	$374,292		$502,771
2063	$128,479	$374,292		$502,771
2064	$128,479	$374,292		$502,771
2065	$128,479	$374,292		$502,771
2066	$128,479	$374,292		$502,771
			Present Value of Discounted Power Credits	$17,284,737
			Average Annual PMA Credit	$655,923

Table 37. Estimated Credits to the PMA Alt7-OptionB

Alt7_OptBN0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$317,068	$317,068
2018			$317,068	$317,068
2019			$317,068	$317,068
2020			$317,068	$317,068
2021			$317,068	$317,068
2022	$51,349	$72,354		$123,703
2023	$51,349	$72,354		$123,703
2024	$51,349	$72,354		$123,703
2025	$51,349	$72,354		$123,703
2026	$51,349	$72,354		$123,703
2027	$51,349	$72,354		$123,703
2028	$51,349	$72,354		$123,703
2029	$51,349	$72,354		$123,703
2030	$51,349	$72,354		$123,703
2031	$51,349	$72,354		$123,703
2032	$51,349	$72,354		$123,703
2033	$51,349	$72,354		$123,703
2034	$51,349	$72,354		$123,703
2035	$51,349	$72,354		$123,703
2036	$51,349	$72,354		$123,703
2037	$51,349	$72,354		$123,703
2038	$51,349	$72,354		$123,703
2039	$51,349	$72,354		$123,703
2040	$51,349	$72,354		$123,703
2041	$51,349	$72,354		$123,703
2042	$51,349	$72,354		$123,703
2043	$51,349	$72,354		$123,703
2044	$51,349	$72,354		$123,703
2045	$51,349	$72,354		$123,703
2046	$51,349	$72,354		$123,703
2047	$51,349	$72,354		$123,703
2048	$51,349	$72,354		$123,703
2049	$51,349	$72,354		$123,703
2050	$51,349	$72,354		$123,703
2051	$51,349	$72,354		$123,703
2052	$51,349	$72,354		$123,703
2053	$51,349	$72,354		$123,703
2054	$51,349	$72,354		$123,703
2055	$51,349	$72,354		$123,703
2056	$51,349	$72,354		$123,703
2057	$51,349	$72,354		$123,703
2058	$51,349	$72,354		$123,703
2059	$51,349	$72,354		$123,703
2060	$51,349	$72,354		$123,703
2061	$51,349	$72,354		$123,703
2062	$51,349	$72,354		$123,703
2063	$51,349	$72,354		$123,703
2064	$51,349	$72,354		$123,703
2065	$51,349	$72,354		$123,703
2066	$51,349	$72,354		$123,703
			Present Value of Discounted Power Credits	$3,931,078
			Average Annual PMA Credit	$151,454

Table 38. Estimated Credits to the PMA Alt7-OptionH

Alt7_OptHx0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$1,846,630	$1,846,630
2018			$1,846,630	$1,846,630
2019			$1,846,630	$1,846,630
2020			$1,846,630	$1,846,630
2021			$1,846,630	$1,846,630
2022	$111,823	$468,549		$580,372
2023	$111,823	$468,549		$580,372
2024	$111,823	$468,549		$580,372
2025	$111,823	$468,549		$580,372
2026	$111,823	$468,549		$580,372
2027	$111,823	$468,549		$580,372
2028	$111,823	$468,549		$580,372
2029	$111,823	$468,549		$580,372
2030	$111,823	$468,549		$580,372
2031	$111,823	$468,549		$580,372
2032	$111,823	$468,549		$580,372
2033	$111,823	$468,549		$580,372
2034	$111,823	$468,549		$580,372
2035	$111,823	$468,549		$580,372
2036	$111,823	$468,549		$580,372
2037	$111,823	$468,549		$580,372
2038	$111,823	$468,549		$580,372
2039	$111,823	$468,549		$580,372
2040	$111,823	$468,549		$580,372
2041	$111,823	$468,549		$580,372
2042	$111,823	$468,549		$580,372
2043	$111,823	$468,549		$580,372
2044	$111,823	$468,549		$580,372
2045	$111,823	$468,549		$580,372
2046	$111,823	$468,549		$580,372
2047	$111,823	$468,549		$580,372
2048	$111,823	$468,549		$580,372
2049	$111,823	$468,549		$580,372
2050	$111,823	$468,549		$580,372
2051	$111,823	$468,549		$580,372
2052	$111,823	$468,549		$580,372
2053	$111,823	$468,549		$580,372
2054	$111,823	$468,549		$580,372
2055	$111,823	$468,549		$580,372
2056	$111,823	$468,549		$580,372
2057	$111,823	$468,549		$580,372
2058	$111,823	$468,549		$580,372
2059	$111,823	$468,549		$580,372
2060	$111,823	$468,549		$580,372
2061	$111,823	$468,549		$580,372
2062	$111,823	$468,549		$580,372
2063	$111,823	$468,549		$580,372
2064	$111,823	$468,549		$580,372
2065	$111,823	$468,549		$580,372
2066	$111,823	$468,549		$580,372
			Present Value of Discounted Power Credits	$20,363,516
			Average Annual PMA Credit	$772,756

Table 39. Estimated Credits to the PMA Alt7-OptionI

Alt7_OptIN0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$1,935,682	$1,935,682
2018			$1,935,682	$1,935,682
2019			$1,935,682	$1,935,682
2020			$1,935,682	$1,935,682
2021			$1,935,682	$1,935,682
2022	$139,824	$482,869		$622,693
2023	$139,824	$482,869		$622,693
2024	$139,824	$482,869		$622,693
2025	$139,824	$482,869		$622,693
2026	$139,824	$482,869		$622,693
2027	$139,824	$482,869		$622,693
2028	$139,824	$482,869		$622,693
2029	$139,824	$482,869		$622,693
2030	$139,824	$482,869		$622,693
2031	$139,824	$482,869		$622,693
2032	$139,824	$482,869		$622,693
2033	$139,824	$482,869		$622,693
2034	$139,824	$482,869		$622,693
2035	$139,824	$482,869		$622,693
2036	$139,824	$482,869		$622,693
2037	$139,824	$482,869		$622,693
2038	$139,824	$482,869		$622,693
2039	$139,824	$482,869		$622,693
2040	$139,824	$482,869		$622,693
2041	$139,824	$482,869		$622,693
2042	$139,824	$482,869		$622,693
2043	$139,824	$482,869		$622,693
2044	$139,824	$482,869		$622,693
2045	$139,824	$482,869		$622,693
2046	$139,824	$482,869		$622,693
2047	$139,824	$482,869		$622,693
2048	$139,824	$482,869		$622,693
2049	$139,824	$482,869		$622,693
2050	$139,824	$482,869		$622,693
2051	$139,824	$482,869		$622,693
2052	$139,824	$482,869		$622,693
2053	$139,824	$482,869		$622,693
2054	$139,824	$482,869		$622,693
2055	$139,824	$482,869		$622,693
2056	$139,824	$482,869		$622,693
2057	$139,824	$482,869		$622,693
2058	$139,824	$482,869		$622,693
2059	$139,824	$482,869		$622,693
2060	$139,824	$482,869		$622,693
2061	$139,824	$482,869		$622,693
2062	$139,824	$482,869		$622,693
2063	$139,824	$482,869		$622,693
2064	$139,824	$482,869		$622,693
2065	$139,824	$482,869		$622,693
2066	$139,824	$482,869		$622,693
			Present Value of Discounted Power Credits	$21,640,024
			Average Annual PMA Credit	$821,197

Table 40. Estimated Credits to the PMA Alt7-OptionK

Alt7_OptKN0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$1,993,749	$1,993,749
2018			$1,993,749	$1,993,749
2019			$1,993,749	$1,993,749
2020			$1,993,749	$1,993,749
2021			$1,993,749	$1,993,749
2022	$145,047	$497,136		$642,182
2023	$145,047	$497,136		$642,182
2024	$145,047	$497,136		$642,182
2025	$145,047	$497,136		$642,182
2026	$145,047	$497,136		$642,182
2027	$145,047	$497,136		$642,182
2028	$145,047	$497,136		$642,182
2029	$145,047	$497,136		$642,182
2030	$145,047	$497,136		$642,182
2031	$145,047	$497,136		$642,182
2032	$145,047	$497,136		$642,182
2033	$145,047	$497,136		$642,182
2034	$145,047	$497,136		$642,182
2035	$145,047	$497,136		$642,182
2036	$145,047	$497,136		$642,182
2037	$145,047	$497,136		$642,182
2038	$145,047	$497,136		$642,182
2039	$145,047	$497,136		$642,182
2040	$145,047	$497,136		$642,182
2041	$145,047	$497,136		$642,182
2042	$145,047	$497,136		$642,182
2043	$145,047	$497,136		$642,182
2044	$145,047	$497,136		$642,182
2045	$145,047	$497,136		$642,182
2046	$145,047	$497,136		$642,182
2047	$145,047	$497,136		$642,182
2048	$145,047	$497,136		$642,182
2049	$145,047	$497,136		$642,182
2050	$145,047	$497,136		$642,182
2051	$145,047	$497,136		$642,182
2052	$145,047	$497,136		$642,182
2053	$145,047	$497,136		$642,182
2054	$145,047	$497,136		$642,182
2055	$145,047	$497,136		$642,182
2056	$145,047	$497,136		$642,182
2057	$145,047	$497,136		$642,182
2058	$145,047	$497,136		$642,182
2059	$145,047	$497,136		$642,182
2060	$145,047	$497,136		$642,182
2061	$145,047	$497,136		$642,182
2062	$145,047	$497,136		$642,182
2063	$145,047	$497,136		$642,182
2064	$145,047	$497,136		$642,182
2065	$145,047	$497,136		$642,182
2066	$145,047	$497,136		$642,182
			Present Value of Discounted Power Credits	$22,305,842
			Average Annual PMA Credit	$846,464

Table 41. Estimated Credits to the PMA Alt7-OptionL

Alt7_OptLN0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$1,191,718	$1,191,718
2018			$1,191,718	$1,191,718
2019			$1,191,718	$1,191,718
2020			$1,191,718	$1,191,718
2021			$1,191,718	$1,191,718
2022	$64,344	$313,644		$378,588
2023	$64,344	$313,644		$378,588
2024	$64,344	$313,644		$378,588
2025	$64,344	$313,644		$378,588
2026	$64,344	$313,644		$378,588
2027	$64,344	$313,644		$378,588
2028	$64,344	$313,644		$378,588
2029	$64,344	$313,644		$378,588
2030	$64,344	$313,644		$378,588
2031	$64,344	$313,644		$378,588
2032	$64,344	$313,644		$378,588
2033	$64,344	$313,644		$378,588
2034	$64,344	$313,644		$378,588
2035	$64,344	$313,644		$378,588
2036	$64,344	$313,644		$378,588
2037	$64,344	$313,644		$378,588
2038	$64,344	$313,644		$378,588
2039	$64,344	$313,644		$378,588
2040	$64,344	$313,644		$378,588
2041	$64,344	$313,644		$378,588
2042	$64,344	$313,644		$378,588
2043	$64,344	$313,644		$378,588
2044	$64,344	$313,644		$378,588
2045	$64,344	$313,644		$378,588
2046	$64,344	$313,644		$378,588
2047	$64,344	$313,644		$378,588
2048	$64,344	$313,644		$378,588
2049	$64,344	$313,644		$378,588
2050	$64,344	$313,644		$378,588
2051	$64,344	$313,644		$378,588
2052	$64,344	$313,644		$378,588
2053	$64,344	$313,644		$378,588
2054	$64,344	$313,644		$378,588
2055	$64,344	$313,644		$378,588
2056	$64,344	$313,644		$378,588
2057	$64,344	$313,644		$378,588
2058	$64,344	$313,644		$378,588
2059	$64,344	$313,644		$378,588
2060	$64,344	$313,644		$378,588
2061	$64,344	$313,644		$378,588
2062	$64,344	$313,644		$378,588
2063	$64,344	$313,644		$378,588
2064	$64,344	$313,644		$378,588
2065	$64,344	$313,644		$378,588
2066	$64,344	$313,644		$378,588
			Present Value of Discounted Power Credits	$13,224,584
			Average Annual PMA Credit	$501,848

Table 42. Estimated Credits to the PMA Alt7-OptionM

Alt7_OptMN0				
Year	Capacity Revenue Foregone	Energy Revenue Foregone	Replacement Cost of Power	Annual Power Credit
2017			$1,563,363	$1,563,363
2018			$1,563,363	$1,563,363
2019			$1,563,363	$1,563,363
2020			$1,563,363	$1,563,363
2021			$1,563,363	$1,563,363
2022	$101,089	$389,487		$490,577
2023	$101,089	$389,487		$490,577
2024	$101,089	$389,487		$490,577
2025	$101,089	$389,487		$490,577
2026	$101,089	$389,487		$490,577
2027	$101,089	$389,487		$490,577
2028	$101,089	$389,487		$490,577
2029	$101,089	$389,487		$490,577
2030	$101,089	$389,487		$490,577
2031	$101,089	$389,487		$490,577
2032	$101,089	$389,487		$490,577
2033	$101,089	$389,487		$490,577
2034	$101,089	$389,487		$490,577
2035	$101,089	$389,487		$490,577
2036	$101,089	$389,487		$490,577
2037	$101,089	$389,487		$490,577
2038	$101,089	$389,487		$490,577
2039	$101,089	$389,487		$490,577
2040	$101,089	$389,487		$490,577
2041	$101,089	$389,487		$490,577
2042	$101,089	$389,487		$490,577
2043	$101,089	$389,487		$490,577
2044	$101,089	$389,487		$490,577
2045	$101,089	$389,487		$490,577
2046	$101,089	$389,487		$490,577
2047	$101,089	$389,487		$490,577
2048	$101,089	$389,487		$490,577
2049	$101,089	$389,487		$490,577
2050	$101,089	$389,487		$490,577
2051	$101,089	$389,487		$490,577
2052	$101,089	$389,487		$490,577
2053	$101,089	$389,487		$490,577
2054	$101,089	$389,487		$490,577
2055	$101,089	$389,487		$490,577
2056	$101,089	$389,487		$490,577
2057	$101,089	$389,487		$490,577
2058	$101,089	$389,487		$490,577
2059	$101,089	$389,487		$490,577
2060	$101,089	$389,487		$490,577
2061	$101,089	$389,487		$490,577
2062	$101,089	$389,487		$490,577
2063	$101,089	$389,487		$490,577
2064	$101,089	$389,487		$490,577
2065	$101,089	$389,487		$490,577
2066	$101,089	$389,487		$490,577
			Present Value of Discounted Power Credits	$17,223,791
			Average Annual PMA Credit	$653,610

Greenhouse Gas Emissions

An environmental benefit associated with hydropower generation is a reduction in greenhouse gas emissions. Generating electricity with hydropower, as opposed to generating electricity with a fossil fuel source, can reduce emissions. Decreases in hydropower production would need to be made up by increasing other sources of power generation, likely to be a fossil fuel source that produces greenhouse gases. Conversely, increases in hydropower production could lead to decreases in greenhouse gases.

The factors used to calculate the increased or decreased emissions depends on the generating resource of the power that would be generating, if not for the hydropower. Since different regions have different generating resource mixes, this factor is regionally dependent. The Environmental Protection Agency's (EPA) eGrid is a comprehensive database of environmental attributes of electric power systems, incorporating data from several Federal agencies. One field of data stored in the eGrid database is emission rates for 26 eGrid subregions. These regions are contained within a single NERC region with similar emissions and generating resource mixes. Emission rates from the eGrid database are defined as pounds per MWh for three greenhouse gases: carbon dioxide, methane, and nitrous oxide. These can be further divided into baseload and non-baseload generating resources. Since hydropower is used to replace the generating resources on the margin in this region, this study uses the non-baseload emission rates. In addition to the three greenhouse gases listed above, Table 43 shows the emission rate for equivalent carbon dioxide for the generating resource mix. This metric is used to define the total global warming potential from the mix of the other three greenhouse gases listed.

The appropriate subregion for this study is the SERC South, where the 2012 database emissions factors (the most recent available) are 1,149.05 lb/MWh, 0.0227 lb/MWh, 0.0155 lb/MWh, and 1,154.32 lb/MWh for carbon dioxide, methane, nitrous oxide, and carbon dioxide equivalent respectively. Table 43 breaks down the emissions for each of the three greenhouse gases in the eGrid database and the relative carbon dioxide equivalent.

Table 43. Annual Greenhouse Gas Emissions due to Changes in Hydropower Production for Each Alternative as compared to the No Action alternative

	Carbon Dioxide (lbs)	Methane (lbs)	Nitrous Oxide (lbs)	Carbon Dioxide Equivalent (lbs)
No Action				
Alt1-OptionL	-15,132,989	-298	-204	-15,202,394
Alt7-OptionA	17,000,195	335	229	17,078,164
Alt7-OptionB	-50,643,230	-999	-683	-50,875,500
Alt7-OptionH	59,587,435	1,175	803	59,860,727
Alt7-OptionI	2,922,034	58	39	2,935,436
Alt7-OptionJ	-77,491,932	-1,528	-1,045	-77,847,341
Alt7-OptionK	79,814,162	1,574	1,076	80,180,222
Alt7-OptionL	-29,353,631	-579	-396	-29,488,259
Alt7-OptionM	12,150,055	240	164	12,205,780

To put these numbers in perspective, the following paragraphs demonstrate some ways to consider these emissions and their impact.

The average vehicle (including cars, minivans, pick-ups, vans, and SUVs) running an average of 12,000 miles per year at an average of 25.5 miles per gallon produces 8,320 pounds of CO2 per year (https://www.americanforests.org/a-carbon-conundrum/). Considering this, the largest emissions producing alternative (the largest reduction in hydropower production), Alt7-OptionK, is the equivalent of 9,593 additional cars running on the road. The alternative that reduces emissions the most, Alt7-OptionJ, would be the equivalent of taking 9,314 cars off the road.

Another way to consider these emissions is to look at the regional energy producers and the emissions they produce. Together, Alabama and Georgia energy producers produce 253 million metric tons of carbon dioxide annually (http://www.eia.gov/state/rankings). The alternative that would produce the most additional carbon dioxide as compared to the no action alternative, Alternative 7 – Option K, would produce 39,907 additional metric tons of carbon dioxide or 0.016 percent of the total produced by Alabama and Georgia. The alternative that would actually increase hydropower production the most and thereby reduce carbon dioxide emissions the most is Alternative 7 – Option J. This would lead to a decrease of 0.015 percent as compared to the energy producers of Alabama and Georgia. The comparisons for each alternative against the total emissions for energy producers in Alabama and Georgia are shown in Table 44.

Table 44. Comparison of Annual Changes in Emissions due to Alternatives to Emissions for All Energy Produced in Alabama and Georgia

Alternative	Carbon Dioxide (lbs)	Carbon Dioxide (metric tons)	CO2 Emissions as a Percentage of AL and GA Energy Producers Emissions
Alt1-OptionL	-15,132,989	-6,864	-0.003%
Alt7-OptionA	17,000,195	7,711	0.003%
Alt7-OptionB	-50,643,230	-22,971	-0.009%
Alt7-OptionH	59,587,435	27,028	0.011%
Alt7-OptionI	2,922,034	1,325	0.001%
Alt7-OptionJ	-77,491,932	-35,150	-0.014%
Alt7-OptionK	79,814,162	36,203	0.014%
Alt7-OptionL	-29,353,631	-13,315	-0.005%
Alt7-OptionM	12,150,055	5,511	0.002%

Finally, in order to try to assign a monetary cost to emissions, the EPA developed an estimated cost index for the social cost of carbon. "The purpose of the social cost of carbon (SCC) estimates…is to allow agencies to incorporate the social benefits of reducing carbon dioxide emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions. The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but it is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change." (https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf)

The social cost of carbon for 2016 is $38 per metric ton of CO2 (using a three percent discount rate). Table 45 illustrates the costs and benefits associated with emissions that these alternatives could produce. Alternatives that increase hydropower production and reduce emissions (Alt1-OptionL, Alt7-OptionB, Alt7-OptionJ, and Alt7-Option L) are negative in the cost column, indicating a reduction in the cost of emissions and a reduction in the impact, and alternatives that decrease hydropower production and increase emissions are included as positive numbers in the costs column, indicating an increase in the social cost of carbon due to these alternatives and an increase in the impact.

Table 45. Annual Greenhouse Gas Emissions "Costs" using EPA's Social Cost of Carbon Index

Alternative	Carbon Dioxide (lbs)	Carbon Dioxide (metric tons)	Social Cost of Carbon for Alternatives
Alt1-OptionL	-15,132,989	-6,864	-$260,840
Alt7-OptionA	17,000,195	7,711	$293,024
Alt7-OptionB	-50,643,230	-22,971	-$872,914
Alt7-OptionH	59,587,435	27,028	$1,027,081
Alt7-OptionI	2,922,034	1,325	$50,366
Alt7-OptionJ	-77,491,932	-35,150	-$1,335,692
Alt7-OptionK	79,814,162	36,203	$1,375,719
Alt7-OptionL	-29,353,631	-13,315	-$505,955
Alt7-OptionM	12,150,055	5,511	$209,425